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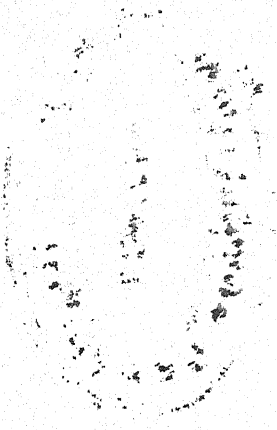
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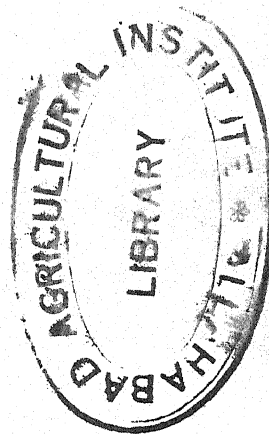
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** Nomenclature of Amino-Acids*

In *Review Articles* it will be that agreed upon by the Editors of the *Journal of the Chemical Society* and of the *Biochemical Journal* published in *Biochem. J.*, 1948, 42, 1.

In *Abstracts* the nomenclature will be that used in the paper being abstracted.

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(Arranged alphabetically according to Contracted Title)

<i>Title of Journal</i>	<i>Contracted Title</i>	<i>Last Number Scrutinised</i>	<i>Place of Publication</i>
Acta Agraria Fennica	Acta agral. fenn.	1953, 80, No. 3	Helsinki, Finland
Acta Agriculturae Scandinavica	Acta Agric. scand.	1953, 3, No. 3	Stockholm, Sweden
Acta Agronomica	Acta agronom., Colombia	1953, 3, No. 3	Palmira, Colombia
Acta Biologica Hungarica	Acta biol. hung.	1953, 4, No. 3/4	Budapest, Hungary
Acta Chemica Scandinavica	Acta chem. scand.	1953, 7, No. 5	Copenhagen, Denmark
Acta Chimica Hungarica	Acta chim. hung.	1953, 3, No. 2	Budapest, Hungary
Acta Cientifica Venezolana	Acta cientif. venezol.	1953, 4, No. 1	Caracas, Venezuela
Acta Gastro-Enterologica Belgica	Acta gastro-enterol. belg.	1953, 16, No. 8/9	Brussels, Belgium
Acta Gerontologica	Acta gerontol.	1953, 3, No. 2	Milan, Italy
Acta Leidensia	Acta leidensia	1950, 21	Leyden, Holland
Acta Medica Hungarica	Acta med. hung.	1953, 4, No. 3/4	Budapest, Hungary
Acta Medica Jugoslavica	Acta med. jugoslav.	1953, 7, No. 1/2	Belgrade, Yugoslavia
Acta Medica Philippina	Acta med. philipp.	1952, 9, No. 2	Manila, Philippines
Acta Medica Scandinavica	Acta med. scand.	1953, 146, No. 5	Stockholm, Sweden
Acta Paediatrica	Acta paediat.	1953, 42, No. 3	Stockholm, Sweden
Acta Paediatrica Belgica	Acta paediat. belg.	1953, 7, No. 3	Brussels, Belgium
Acta Pathologica et Microbiologica Scandinavica	Acta pathol. microbiol. scand.	1953, 33, No. 2	Copenhagen, Denmark
Acta Physiologica Hungarica	Acta physiol. hung.	1953, 4, No. 3/4	Budapest, Hungary
Acta Physiologica et Pharmacologica Neerlandica	Acta physiol. pharmacol. neerl.	1951/52, 2, No. 4	Amsterdam, Holland
Acta Physiologica Scandinavica	Acta physiol. scand.	1953, 29, No. 1	Stockholm, Sweden
Acta Radiologica	Acta radiol.	1953, 40, No. 1	Stockholm, Sweden
Acta Scholae Medicinalis in Kioto	Acta Scholae med. Univ. Kioto	1953, 30, No. 3	Kioto, Japan
Acta Societatis Medicorum Upsaliensis	Acta Soc. Med. upsalien.	1953, 58, No. 5/6	Upsala, Sweden
Acta Vitaminologica	Acta vitaminol.	1953, 7, No. 4	Milan, Italy
Advances in Agronomy	Advances in Agronomy	1952, 4	New York, U.S.A.
Advances in Biological and Medical Physics	Advances in Biol. Med. Phys.	1953, 3	New York, U.S.A.
Advances in Carbohydrate Chemistry	Advances in Carbohydrate Chem.	1952, 7	New York, U.S.A.
Advances in Enzymology	Advances in Enzymol.	1953, 14	New York, U.S.A.
Advances in Food Research	Advances in Food Res.	1953, 4	New York, U.S.A.
Advances in Protein Chemistry	Advances in Protein Chem.	1953, 7	New York, U.S.A.
Advances in Veterinary Science	Advances in Vet. Sci.	1953, 1	London, England
Agricultural Engineering	Agric. Eng.	1953, 34, No. 9	St. Joseph, Mich., U.S.A.
Agricultural Gazette of New South Wales	Agric. Gaz. N.S.W.	1953, 64, No. 7	Sydney, Australia
Agricultural Progress	Agric. Progress	1952, 27, No. 1	London, England
Agriculture, Journal of the Ministry of Agriculture	Agriculture, J. Minist. Agric. Engl.	1953, 60, No. 6	London, England
Agronomy Journal	Agronom. J.	1953, 45, No. 8	Washington, D.C., U.S.A.
Agronomia Lusitana	Agronom. lusitana	1952, 14, No. 4	Alcobaca, Portugal
Akusherstvo i Ginekologiya	Akusherstvo Ginekol.	1952, No. 6	Moscow, U.S.S.R.
American Economic Review	Amer. Econ. Rev.	1953, 43, No. 3	Menasha, Wis., U.S.A.
American Heart Journal	Amer. Heart J.	1953, 46, No. 1	St. Louis, Mo., U.S.A.
American Journal of Anatomy	Amer. J. Anat.	1953, 93, No. 1	Philadelphia, Pa., U.S.A.
American Journal of Digestive Diseases	Amer. J. Digest. Dis.	1953, 20, No. 8	Fort Wayne, Ind., U.S.A.
American Journal of Diseases of Children	Amer. J. Dis. Child.	1953, 86, No. 2	Chicago, Ill., U.S.A.
American Journal of Medicine	Amer. J. Med.	1953, 15, No. 1	New York, U.S.A.
American Journal of Medical Sciences	Amer. J. Med. Sci.	1953, 226, No. 1	Philadelphia, Pa., U.S.A.
American Journal of Obstetrics and Gynecology	Amer. J. Obstet. Gynecol.	1953, 66, No. 2	St. Louis, Mo., U.S.A.
American Journal of Ophthalmology	Amer. J. Ophthalmol.	1953, 36, No. 8	Menasha, Wis., U.S.A.
American Journal of Orthopsychiatry	Amer. J. Orthopsychiat.	1953, 23, No. 3	Menasha, Wis., U.S.A.
American Journal of Pathology	Amer. J. Pathol.	1953, 29, No. 4	Ann Arbor, Mich., U.S.A.
American Journal of Physical Anthropology	Amer. J. Phys. Anthropol.	1953, 11, No. 2	Philadelphia, Pa., U.S.A.
American Journal of Physiology	Amer. J. Physiol.	1953, 174, No. 2	Baltimore, Md., U.S.A.
American Journal of Surgery	Amer. J. Surg.	1953, 86, No. 1	New York, U.S.A.
American Journal of Veterinary Research	Amer. J. Vet. Res.	1953, 14, No. 53	Chicago, Ill., U.S.A.
Analytical Chemistry	Anal. Chem.	1953, 25, No. 8	Washington, D.C., U.S.A.
Analytica Chimica Acta	Anal. chim. Acta	1953, 9, No. 2	Amsterdam, Holland
Analyst	Analyst	1953, 78, No. 930	London, England
Anatomical Record	Anat. Rec.	1953, 116, No. 3	Philadelphia, Pa., U.S.A.

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<i>Title of Journal</i>	<i>Contracted Title</i>	<i>Last Number Scrutinised</i>	<i>Place of Publication</i>
Anais da Faculdade de Medicina da Universidade de São Paulo	An. Fac. Med. Univ. São Paulo	1952, 26, No. 1	São Paulo, Brazil
Anales de la Facultad de Veterinaria de la Universidad de Madrid	An. Fac. Vet. Univ. Madrid	1952, 14, No. 1	Madrid, Spain
Anais do Instituto de Medicina Tropical	An. Inst. Med. trop.	1952, 9, No. 2	Lisbon, Portugal
Annales de l'Institut National de la Recherche Agromique. A. Annales Agronomiques	Ann. agronom.	1953, 4, No. 3	Paris, France
Annals of Applied Biology	Ann. Appl. Biol.	1953, 40, No. 2	Cambridge, England
Annales de Chimie	Ann. Chim., Paris	1953, 8, June	Paris, France
Annals of Eugenics	Ann. Eugenics	1953, 18, No. 2	London, England
Annales de l'Institut Pasteur	Ann. Inst. Pasteur	1953, 85, No. 2	Paris, France
Annals of Internal Medicine	Ann. Int. Med.	1953, 39, No. 2	Ann Arbor, Mich., U.S.A.
Annales Medicinæ Experimentalis et Biologiae Fenniae	Ann. Med. exp. Biol. Fenn.	1953, 81, No. 2	Helsinki, Finland
Annales Medicinæ Internæ Fenniae	Ann. Med. int. Fenn.	1953, 42, No. 3	Helsinki, Finland
Annales de la Nutrition et de l'Alimentation	Ann. Nutr. Alimentation	1953, 7, No. 4	Paris, France
Annales d'Oculistique	Ann. Oculist.	1953, 186, No. 8	Paris, France
Annals of Otolaryngology and Rhinology	Ann. Otol. Rhinol. Laryngol.	1953, 62, No. 2	St. Louis, Mo., U.S.A.
Annales Paediatricæ	Ann. paediat.	1953, 181, No. 3	Basle, Switzerland
Annales de Parasitologie Humaine et Comparée	Ann. Parasitol.	1953, 28, No. 3	Paris, France
Annales Pharmaceutiques Françaises	Ann. pharm. franç.	1953, 11, No. 7/8	Paris, France
Annals of Science	Ann. Sci.	1953, 9, No. 2	London, England
Annales de la Société Belge de Médecine Tropicale	Ann. Soc. belg. Méd. trop.	1953, 33, No. 3	Brussels, Belgium
Annali della Sperimentazione Agraria	Ann. Sper. agrar.	1952, 6, No. 4	Rome, Italy
Annals of Surgery	Ann. Surg.	1953, 138, No. 1	Philadelphia, Pa., U.S.A.
Annals of Tropical Medicine and Parasitology	Ann. Trop. Med. Parasitol.	1953, 47, No. 2	Liverpool, England
Annual Review of Biochemistry	Annu. Rev. Biochem.	1953, 22	California, U.S.A.
Annual Review of Medicine	Annu. Rev. Med.	1953, 4	California, U.S.A.
Annual Review of Microbiology	Annu. Rev. Microbiol.	1953, 7	Stanford, Calif., U.S.A.
Annual Review of Physiology	Annu. Rev. Physiol.	1953, 15	California, U.S.A.
Antiseptic	Antiseptic	1953, 50, No. 7	Madras, India
Antonie van Leeuwenhoek Journal of Microbiology and Serology	Antonie van Leeuwenhoek J. Microbiol. Serol.	1953, 19, No. 4	Amsterdam, Holland
Applied Statistics. A Journal of the Royal Statistical Society	Appl. Statistics	1953, 2, No. 2	London, England
Arbeitsphysiologie	Arbeitsphysiologie	1953, 15, No. 1	Berlin : Göttingen : Heidelberg, Germany
Archives of Biochemistry and Biophysics	Arch. Biochem. Biophys.	1953, 45, No. 2	New York, U.S.A.
Archives of Disease in Childhood	Arch. Dis. Childhood	1952, 27, No. 136	London, England
Naunyn-Schmiedeberg's Archiv für Experimentelle Pathologie und Pharmacologie	Arch. exp. Pathol. Pharmacol.	1953, 219, No. 6	Berlin : Göttingen : Heidelberg, Germany
Archivio di Fisiologia	Arch. Fisiol.	1953, 53, No. 2	Florence, Italy
Archiv für Geflügelkunde	Arch. Geflügelk.	1952, 17, No. 9/10	Stuttgart : Berlin, Germany
Archiv für Geschwulstforschung	Arch. Geschwulstforsch.	1953, 5, No. 3	Dresden : Leipzig, Germany
Archiv für Gynäkologie	Arch. Gynäkol.	1952-53, 182, No. 5	Munich, Germany
Archives of Industrial Hygiene and Occupational Medicine	Arch. Indust. Hyg.	1953, 8, No. 2	Chicago, Ill., U.S.A.
Archives de l'Institut Pasteur d'Algérie	Arch. Inst. Pasteur Algérie	1953, 31, No. 2	Algiers, Algeria
Archives Internationales de Pharmacodynamie et de Thérapie	Arch. internat. Pharmacodyn.	1953, 94, No. 3	Ghent, Belgium
Archives Internationales de Physiologie	Arch. internat. Physiol.	1953, 61, No. 3	Liège, Belgium
Archives of Internal Medicine	Arch. Int. Med.	1953, 92, No. 2	Chicago, Ill., U.S.A.
Archivio Italiano delle Malattie dell'Apparato Digerente	Arch. ital. Malat. Appar. diger.	1953, 19, No. 2	Bologna, Italy
Archivio Italiano di Pediatria e Puericoltura	Arch. ital. Pediat. Puericult.	1952, 15, No. 3	Bologna, Italy
Archives des Maladies de l'Appareil Digestif et des Maladies de la Nutrition	Arch. Mal. Appar. digest.	1953, 42, No. 5	Paris, France
Archiva Medica Belgica	Arch. med. belg.	1953, 8, No. 3	Brussels, Belgium
Archives of Neurology and Psychiatry	Arch. Neurol. Psychiat., Chicago	1953, 69, No. 4	Chicago, Ill., U.S.A.
Archives of Pathology	Arch. Pathol.	1953, 56, No. 2	Chicago, Ill., U.S.A.
Archives of Pediatrics	Arch. Pediat.	1953, 70, No. 7	New York, U.S.A.
Archiv der Pharmazie	Arch. Pharm.	1953, 286, No. 7	Weinheim, Germany
Archiv for Pharmacology and Chemistry	Arch. Pharm. Chem.	1953, 60, No. 17	Copenhagen, Denmark
Archives Portugaises des Sciences Biologiques	Arch. portugaises Sci. biol.	1950-51, 10, No. 2/3	Lisbon, Portugal
Archiv für Psychiatrie und Nervenkrankheiten	Arch. Psychiat. Nervenkrankh.	1953, 190, No. 5	Berlin : Heidelberg : Göttingen, Germany
Archivio di Scienze Biologiche	Arch. Sci. biol., Bologna	1953, 37, No. 3	Bologna, Italy
Archives des Sciences Physiologiques	Arch. Sci. physiol.	1953, 7, No. 3	Paris, France
Archiv für Tierernährung	Arch. Tierernährung	1952, 3, No. 3	Berlin, Germany
Archivos Uruguayos de Medicina, Cirugía y Especialidades	Arch. urug. Med.	1953, 42, No. 1/2	Montevideo, Uruguay

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Archivos Venezolanos de Nutricion	Arch. venezol. Nutricion	1952, 3, No. 1	Caracas, Venezuela
Arkiv Patologi	Ark. Patol.	1952, 14, No. 6	Moscow, U.S.S.R.
Arkiv för Kemi	Ark. Kemi	1953, 5, No. 6	Uppsala, Sweden
Arkiv för Zoologi	Ark. Zool.	1952, 4, No. 5	Uppsala, Sweden
Arquivos Brasileiros de Nutrição	Arq. brasil. Nutrição	1951, 8, No. 6	Rio de Janeiro, Brazil
Australian Journal of Agricultural Research	Austral. J. Agric. Res.	1953, 4, No. 3	Melbourne, Australia
Australian Journal of Biological Sciences	Austral. J. Biol. Sci.	1953, 6, No. 1	Melbourne, Australia
Australian Journal of Botany	Austral. J. Botany	1953, 1, No. 2	Melbourne, Australia
Australian Journal of Experimental Biology and Medical Science	Austral. J. Exp. Biol. Med. Sci.	1953, 31, No. 4	Adelaide, Australia
Australian Journal of Zoology	Austral. J. Zool.	1953, 1, No. 2	Melbourne, Australia
Australian Veterinary Journal	Austral. Vet. J.	1953, 29, No. 7	Sydney, Australia
Bacteriological Reviews	Bacteriol. Rev.	1953, 17, No. 3	Baltimore, Md., U.S.A.
Beiträge zur Pathologischen Anatomie und zur Allgemeinen Pathologie	Beitr. pathol. Anat.	1953, 113, No. 1	Jena, Germany
Berliner und Münchener Tierärztliche Wochenschrift	Berl. Münch. tierärztl. Wochenschr.	1953, 66, No. 18	Berlin, Germany
Biochemical Journal	Biochem. J.	1953, 55, No. 2	London, England
Biochemische Zeitschrift	Biochem. Zeitschr.	1953, 324, No. 3	Berlin : Göttingen : Heidelberg, Germany
Biochimica et Biophysica Acta	Biochim. biophys. Acta	1953, 11, No. 4	New York, U.S.A.
Biokhimiya	Biokhimiya	1953, 18, No. 1	Moscow : Leningrad, U.S.S.R.
Biological Bulletin	Biol. Bull.	1953, 105, No. 1	Lancaster, Pa., U.S.A.
Biologie Médicale	Biol. méd.	1953, 42, No. 5	Paris, France
Biological Progress	Biol. Progr.	1952, 2	New York, U.S.A.
Biological Reviews and Biological Proceedings of the Cambridge Philosophical Society	Biol. Rev.	1953, 28, No. 2	Cambridge, England
Biometrika	Biometrika	1953, 40, No. 1/2	London, England
Blood, The Journal of Hematology	Blood, J. Hematol.	1953, 8, No. 9	New York, U.S.A.
Boletín de la Oficina Sanitaria Panamericana	Bol. Ofic. sanit. panamer.	1953, 35, No. 1	Washington, D.C., U.S.A.
Bollettino dell'Istituto Sieroterapico Milanese	Bol. Ist. sieroterap. milan.	1953, 32, No. 7/8	Milan, Italy
Bollettino della Società Italiana di Biologia Sperimentale	Bol. Soc. ital. Biol. sper.	1953, 29, No. 3	Naples, Italy
Brain. A Journal of Neurology	Brain	1953, 76, No. 2	London, England
British Agricultural Bulletin	Brit. Agric. Bull.	1953, 6, No. 28	London, England
British Dental Journal	Brit. Dent. J.	1953, 95, No. 6	London, England
British Heart Journal	Brit. Heart J.	1953, 15, No. 3	London, England
British Journal of Animal Behaviour	Brit. J. Animal Behaviour	1953, 1, No. 3	London, England
British Journal of Dermatology and Syphilis	Brit. J. Dermatol.	1953, 65, No. 9	London, England
British Journal of Experimental Pathology	Brit. J. Exp. Pathol.	1953, 34, No. 4	London, England
British Journal of Industrial Medicine	Brit. J. Indust. Med.	1953, 10, No. 3	London, England
British Journal of Nutrition	Brit. J. Nutrition	1953, 7, No. 3	London, England
British Journal of Ophthalmology	Brit. J. Ophthalmol.	1953, 37, No. 10	London, England
British Journal of Pharmacology and Chemotherapy	Brit. J. Pharmacol. Chemotherap.	1953, 8, No. 2	London, England
British Journal of Radiology	Brit. J. Radiol.	1953, 26, No. 309	London, England
British Journal of Preventive and Social Medicine	Brit. J. Prev. Social Med.	1953, 7, No. 3	London, England
British Journal of Surgery	Brit. J. Surg.	1953, 41, No. 165	Bristol, England
British Journal of Urology	Brit. J. Urol.	1953, 25, No. 2	Bristol, England
British Medical Bulletin	Brit. Med. Bull.	1953, 9, No. 2	London, England
British Medical Journal	Brit. Med. J.	1953, No. 4837	London, England
British Veterinary Journal	Brit. Vet. J.	1953, 109, No. 9	London, England
Bulletin de l'Académie Vétérinaire de France	Bull. Acad. vét. France	1953, 26, No. 4	Paris, France
Bulletin of the Central Food Technological Research Institute, Mysore	Bull. Central Food Technol. Res. Inst. Mysore	1953, 2, No. 8	Mysore, India
Bulletin of the History of Medicine	Bull. Hist. Med.	1952, 27, No. 3	Baltimore, Md., U.S.A.
Bulletin de l'Institut Agronomique et de Recherches de Gembloux	Bull. Inst. agronom. Gembloux	1953, 20, No. 3/4	Gembloux, Belgium
Bulletin of the Institute for Medical Research, University of Madrid	Bull. Inst. Med. Res., Univ. Madrid	1952, 5, No. 3	Madrid, Spain
Bulletin de l'Institut National d'Hygiène	Bull. Inst. nat. Hyg., Paris	1953, 8, No. 3	Paris, France
Bulletin Oxford University Institute of Statistics	Bull. Inst. Statistics Oxford	1953, 15, No. 8	Oxford, England
Bulletin of the Johns Hopkins Hospital	Bull. Johns Hopkins Hosp.	1953, 93, No. 1	Baltimore, Md., U.S.A.
Bulletin de Microscopie Appliquée	Bull. Microscop. appl.	1953, 3, No. 5	Paris, France
Bulletin of the National Institute of Agricultural Sciences, Yahagi, Japan	Bull. Nat. Inst. Agric. Sci., Japan	1953, No. 6	Chiba, Japan
Bulletin de la Société de Chimie Biologique	Bull. Soc. Chim. biol.	1953, 35, No. 8	Paris, France
Bulletin de la Société Chimique de France	Bull. Soc. chim. France	1953, No. 9	Paris, France
Bulletin de la Société de Pathologie Exotique	Bull. Soc. Pathol. exot.	1953, 46, No. 4	Paris, France
Bulletin de la Société Scientifique d'Hygiène Alimentaire	Bull. Soc. sci. Hyg. aliment.	1953, 41, No. 3	Paris, France
Bulletin of the State Institute of Marine and Tropical Medicine in Gdansk, Poland	Bull. State Inst. Marine Trop. Med. Gdansk	1952, 4, No. 4	Warsaw, Poland

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<i>Title of Journal</i>	<i>Contracted Title</i>	<i>Last Number Scrutinised</i>	<i>Place of Publication</i>
Bulletin of the World Health Organization	Bull. World Health Organiz.	1953, 9, No. 2	Geneva, Switzerland
Calcutta Medical Journal	Calcutta Med. J.	1953, 50, No. 6	Calcutta, India
Canadian Journal of Agricultural Science	Canad. J. Agric. Sci.	1953, 33, No. 5	Ottawa, Canada
Canadian Journal of Botany	Canad. J. Botany	1953, 31, No. 4	Ottawa, Canada
Canadian Journal of Chemistry	Canad. J. Chem.	1953, 31, No. 8	Ottawa, Canada
Canadian Journal of Comparative Medicine	Canad. J. Comp. Med.	1953, 17, No. 7	Quebec, Canada
Canadian Journal of Medical Science	Canad. J. Med. Sci.	1953, 31, No. 4	Ottawa, Canada
Canadian Journal of Physics	Canad. J. Phys.	1953, 31, No. 5	Ottawa, Canada
Canadian Journal of Technology	Canad. J. Technol.	1953, 31, No. 8	Ottawa, Canada
Canadian Journal of Zoology	Canad. J. Zool.	1953, 31, No. 4	Ottawa, Canada
Canadian Medical Association Journal	Canad. Med. Assoc. J.	1953, 69, No. 3	Toronto, Canada
Cancer Research	Cancer Res.	1953, 13, No. 8	Chicago, Ill., U.S.A.
Časopis Lékařů Českých	Čas. Léč. čes.	1953, 92, No. 41	Prague, Czechoslovakia
Cereal Chemistry	Cereal Chem.	1953, 30, No. 4	Pennsylvania, U.S.A.
The Ceylon Journal of Medical Science	Ceylon J. Med. Sci.	1951-53, 8, No. 3	Colombo, Ceylon
Chemistry and Industry	Chem. and Indust.	1953, No. 38	London, England
Chemische Berichte	Chem. Ber.	1953, 86, No. 7	Weinheim, Germany
Chemical Reviews	Chem. Rev.	1953, 53, No. 1	Baltimore, Md., U.S.A.
Chinese Medical Journal	Chinese Med. J.	1953, 71, No. 4	Peking, China
Chronicle of the World Health Organization	Chron. World Health Organiz.	1953, 7, No. 7/8	New York, U.S.A.
Clinical Science	Clin. Sci.	1953, 12, No. 3	London, England
Colonial Plant and Animal Products	Colonial Plant Animal Prod.	1953, 3, No. 2	London, England
Cornell Veterinarian	Cornell Vet.	1953, 43, No. 3	Ithaca, N.Y., U.S.A.
Comptes Rendus Hebdomadaires des Séances de l'Académie des Sciences	C.R. Acad. Sci.	1953, 237, No. 11	Paris, France
Comptes Rendus des Travaux du Laboratoire Carlsberg (Série Chimique)	C.R. Lab. Carlsberg (Sér. chim.)	1951-53, 28, No. 17	Copenhagen, Denmark
Comptes Rendus des Travaux du Laboratoire Carlsberg (Série Physiologique)	C.R. Lab. Carlsberg (Sér. physiol.)	1950-53, 25, No. 6	Copenhagen, Denmark
Comptes Rendus des Séances de la Société de Biologie	C.R. Soc. Biol.	1953, 147, No. 7/8	Paris, France
Dansk Tidsskrift for Farmaci	Dansk Tidsskr. Farm.	1953, 27, No. 9	Copenhagen, Denmark
Dental Journal of Australia	Dent. J. Austral.	1953, 25, No. 3/4	Sydney, Australia
Deutsches Archiv für Klinische Medizin	Deutsch. Arch. klin. Med.	1953, 200, No. 4	Munich, Germany
Deutsche Medizinische Wochenschrift	Deutsch. med. Wochenschr.	1953, 78, No. 29	Stuttgart, Germany
Deutsche Zeitschrift für Verdauungs- und Stoffwechselkrankheiten	Deutsch. Ztschr. Verdauungs- u. Stoffwechselkr.	1953, 13, No. 5	Leipzig, Germany
Documenta de Medicina Geographica et Tropica	Doc. Med. geogr. trop.	1953, 5, No. 2	Amsterdam, Holland
Doklady Akademii Nauk S.S.S.R.	Dokl. Akad. Nauk S.S.S.R.	1953, 90, No. 1	Moscow, U.S.S.R.
Doklady Vsesoyuznoi Akademii Sel'skokhozyaistvennykh Nauk im. V.I. Lenina	Dokl. Vses. Akad. Sel'skokhoz. Nauk V.I. Lenina	1952, 17, No. 12	Moscow, U.S.S.R.
East African Agricultural Journal of Kenya, Tanganyika, Uganda and Zanzibar	East African Agric. J.	1953, 18, No. 4	Nairobi, Kenya
East African Medical Journal	East African Med. J.	1953, 30, No. 5	Nairobi, Kenya
Economic Journal	Econ. J.	1953, 63, No. 251	London, England
Economic Proceedings of the Royal Dublin Society	Econ. Proc. Roy. Dublin Soc.	1951, 4, No. 2	Dublin, Republic of Ireland
Economica	Economica	1953, 20, No. 79	London, England
Edinburgh Medical Journal	Edinb. Med. J.	1953, 60, No. 9	Edinburgh, Scotland
Empire Journal of Experimental Agriculture	Empire J. Exp. Agric.	1953, 21, No. 82	Harpden, England
Endeavour	Endeavour	1953, 12, No. 48	London, England
Endocrinology	Endocrinology	1953, 53, No. 3	Boston, Mass. U.S.A.
Enzymologia	Enzymologia	1953, 16, No. 2	Amsterdam, Holland
Experientia	Experientia	1953, 9, No. 9	Basle, Switzerland
Experimental Cell Research	Exp. Cell. Res.	1953, 5, No. 1	New York, U.S.A.
Experimental Medicine and Surgery	Exp. Med. Surg.	1953, 11, No. 2	Basle, Switzerland
Experimental Parasitology	Exp. Parasitol.	1953, 2, No. 3	New York, U.S.A.
Farming in South Africa	Farming in S. Africa	1953, 23, No. 328	Pretoria, South Africa
Federation Proceedings	Federation Proc.	1953, 12, No. 2	Baltimore, Md., U.S.A.
Fiji Agricultural Journal	Fiji Agric. J.	1952, 23, No. 3/4	Suva, Fiji
Fisheries Research Board of Canada, Progress Reports of the Atlantic Coast Stations	Fish. Res. Board Canada, Progr. Rep. Atlantic Coast Stat.	1953, No. 55	St. Andrew, N.B., Canada
Fisheries Research Board of Canada, Progress Reports of the Pacific Coast Stations	Fish. Res. Board Canada, Progr. Rep. Pacific Coast Stat.	1953, No. 95	Vancouver, B.C., Canada
Fiziologicheskii Zhurnal S.S.S.R. im. I.M. Sechenova	Fiziol. Zh. S.S.S.R. Sechenova	1952, 39, No. 1	Leningrad, U.S.S.R.
Folia Haematologica	Folia haematol.	1953, 72, No. 1	Leipzig, Germany
Food Research	Food Res.	1953, 13, No. 4	Illinois, U.S.A.
Forskning og Forsøk i Landbruget	Forskning og Forsøk Landbruget	1953, 4, No. 3	Oslo, Norway
Forsøgslaboratoriet København Beretning	Forsøgslab. København Beretn.	1953, No. 267	Copenhagen, Denmark
Frankfurter Zeitschrift für Pathologie	Frankfurter Ztschr. Pathol.	1953, 64, No. 2	Munich, Germany
Gastroenterologia	Gastroenterologia	1953, 80, No. 2/3	Basle, Switzerland
Gazetta Chimica Italiana	Gaz. chim. ital.	1953, 83, No. 6	Rome, Italy

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<i>Title of Journal</i>	<i>Contracted Title</i>	<i>Last Number Scrutinised</i>	<i>Place of Publication</i>
Geriatrics	Geriatrics	1953, 8, No. 8	Minneapolis, Minn., U.S.A.
Gigiena i Sanitariya	Gigiena Sanit.	1952, No. 9	Moscow, U.S.S.R.
Glasgow Medical Journal	Glasgow Med. J.	1953, 34, No. 8	Glasgow, Scotland
Albrecht von Graefes Archiv für Ophthalmologie	v. Graefes Arch. Ophthalmol.	1953, 154, No. 1	Heidelberg: Berlin: Munich, Germany
Growth	Growth	1953, 17, No. 1	Philadelphia, Pa., U.S.A.
Gunma Journal of Medical Sciences	Gunma J. Med. Sci.	1953, 2, No. 2	Maebashi, Japan
Guy's Hospital Reports	Guy's Hosp. Rep.	1953, 102, No. 3	London, England
Helvetica Chimica Acta	Helv. chim. Acta	1953, 36, No. 5	Basle, Switzerland
Helvetica Paediatrica Acta	Helv. paediat. Acta	1953, 8, No. 4	Basle, Switzerland
Helvetica Physiologica Pharmacologica Acta	Helv. physiol. pharm. Acta	1953, 11, No. 2	Basle, Switzerland
Hoppe-Seyler's Zeitschrift für Physiologische Chemie	Hoppe-Seyler's Ztschr.	1953, 293, No. 2/3	Berlin, Germany
Indian Farming	Indian Farming	1953, 3, No. 5	Delhi, India
Indian Journal of Agricultural Science	Indian J. Agric. Sci.	1953, 23, No. 1	Delhi, India
Indian Journal of Dairy Science	Indian J. Dairy Sci.	1953, 6, No. 2	Bangalore, India
Indian Journal of Malariology	Indian J. Malariol.	1952, 6, No. 3	Calcutta, India
Indian Journal of Medical Research	Indian J. Med. Res.	1952, 40, No. 4	Calcutta, India
Indian Journal of Pediatrics	Indian J. Pediat.	1953, 20, No. 79	Calcutta, India
Indian Journal of Physiology and Allied Sciences	Indian J. Physiol. Allied Sci.	1952, 6, No. 4	Calcutta, India
Indian Journal of Veterinary Science and Animal Husbandry	Indian J. Vet. Sci.	1952, 22, No. 4	Delhi, India
Indian Medical Gazette	Indian Med. Gaz.	1952, 87, No. 12	Calcutta, India
Industrial and Engineering Chemistry	Indust. Eng. Chem.	1953, 45, No. 9	Washington, D.C., U.S.A.
Instrument Practice: Technology: Instrumentation	Instrument Practice	1952, 7, No. 10	London, England
International Journal of Leprosy	Internat. J. Leprosy	1953, 21, No. 1	New Orleans, La., U.S.A.
International Labour Review	Internat. Labour Rev.	1953, 68, No. 2	Geneva, Switzerland
Internationale Zeitschrift für Vitaminforschung	Internat. Ztschr. Vitaminforsch.	1952, 24, No. 4	Berne, Switzerland
Izvestiya Akademii Nauk S.S.S.R. Seriya Biologicheskaya	Izv. Akad. Nauk S.S.S.R. Ser. Biol.	1953, No. 3	Moscow, U.S.S.R.
Japanese Journal of Experimental Medicine	Jap. J. Exp. Med.	1952, 22, No. 6	Tokyo, Japan
Japanese Journal of Medical Science and Biology	Jap. J. Med. Sci.	1953, 6, No. 2	Tokyo, Japan
Journal of Agricultural and Food Chemistry	J. Agric. Food Chem.	1953, 1, No. 12	Washington, D.C., U.S.A.
Journal of Agricultural Science	J. Agric. Sci.	1953, 43, No. 3	Cambridge, England
Journal of Agriculture of the University of Puerto Rico	J. Agric. Univ. Puerto Rico	1953, 37, No. 2	Rio Piedras, Puerto Rico
Journal of Agriculture of Western Australia	J. Agric. W. Austral.	1953, 2, No. 3	Perth, Australia
Journal of the American Chemical Society	J. Amer. Chem. Soc.	1953, 75, No. 17	Washington, D.C., U.S.A.
Journal of the American Dietetic Association	J. Amer. Dietetic Assoc.	1953, 29, No. 8	Baltimore, Md., U.S.A.
Journal of the American Medical Association	J. Amer. Med. Assoc.	1953, 149, No. 12	Chicago, Ill., U.S.A.
Journal of the American Pharmaceutical Association	J. Amer. Pharm. Assoc.	1953, 42, No. 9	Washington, D.C., U.S.A.
Journal of the American Veterinary Medical Association	J. Amer. Vet. Med. Assoc.	1953, 123, No. 918	Chicago, Ill., U.S.A.
Journal of Anatomy	J. Anat.	1953, 87, No. 3	London, England
Journal of Animal Ecology	J. Animal Ecol.	1953, 22, No. 1	Cambridge, England
Journal of Animal Science	J. Animal Sci.	1953, 12, No. 3	Menasha, Wis., U.S.A.
Journal of Applied Chemistry	J. Appl. Chem.	1952, 2, No. 12	London, England
Journal of Applied Physiology	J. Appl. Physiol.	1953, 6, No. 1	Washington, D.C., U.S.A.
Journal of the Association of Official Agricultural Chemists	J. Assoc. Off. Agric. Chem.	1953, 36, No. 2	Washington, D.C., U.S.A.
Journal of the Australian Institute of Agricultural Science	J. Austral. Inst. Agric. Sci.	1953, 19, No. 2	Sydney, Australia
Journal of Aviation Medicine	J. Aviation Med.	1953, 24, No. 3	New Orleans, La., U.S.A.
Journal of Bacteriology	J. Bacteriol.	1953, 66, No. 2	Baltimore, Md., U.S.A.
Journal of Biochemistry	J. Biochem., Tokyo	1953, 40, No. 3	Tokyo, Japan
Journal of Biological Chemistry	J. Biol. Chem.	1953, 204, No. 2	Baltimore, Md., U.S.A.
Journal of the British Grassland Society	J. Brit. Grassland Soc.	1953, 8, No. 3	Aberystwyth, Wales
Journal of Cellular and Comparative Physiology	J. Cell. Comp. Physiol.	1953, 42, No. 1	Philadelphia, Pa., U.S.A.
Journal of the Chemical Society, London	J. Chem. Soc.	1953, August	London, England
Journal of Clinical Endocrinology and Metabolism	J. Clin. Endocrinol.	1953, 13, No. 7	Springfield, Ill., U.S.A.
Journal of Clinical Investigation	J. Clin. Invest.	1953, 32, No. 8	Lancaster, Pa., U.S.A.
Journal of Clinical Nutrition	J. Clin. Nutrit.	1953, 1, No. 4	Allentown, Pa., U.S.A.
Journal of Clinical Pathology	J. Clin. Pathol.	1953, 6, No. 3	London, England
Journal of Comparative Neurology	J. Comp. Neurol.	1953, 99, No. 1	Philadelphia, Pa., U.S.A.
Journal of Comparative Pathology and Therapeutics	J. Comp. Pathol.	1953, 63, No. 3	Croydon, Surrey, England
Journal of Dairy Research	J. Dairy Res.	1953, 20, No. 2	London, England
Journal of Dairy Science	J. Dairy Sci.	1953, 36, No. 9	Lancaster, Pa., U.S.A.
Journal of Dental Research	J. Dent. Res.	1953, 32, No. 4	Baltimore, Md., U.S.A.
Journal of the Department of Agriculture, Republic of Ireland	J. Dept. Agric., Republic of Ireland	1953, 48	Dublin, Republic of Ireland
Journal of the Department of Agriculture of South Australia	J. Dept. Agric. S. Austral.	1953, 57, No. 1	Adelaide, Australia

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Journal of the Department of Agriculture, Victoria	J. Dept. Agric., Victoria	1953, 51, No. 7	Melbourne, Australia
Journal of Economic Entomology	J. Econ. Entomol.	1953, 46, No. 3	Geneva, N.Y., U.S.A.
Journal of Endocrinology	J. Endocrinol.	1953, 9, No. 3	London, England
Journal of Experimental Biology	J. Exp. Biol.	1953, 30, No. 3	London, England
Journal of Experimental Medicine	J. Exp. Med.	1953, 98, No. 1	Baltimore, Md., U.S.A.
Journal of Experimental Zoology	J. Exp. Zool.	1953, 123, No. 2	Philadelphia, Pa., U.S.A.
Journal of Farm Economics	J. Farm Econ.	1953, 35, No. 2	Menasha, Wis., U.S.A.
Journal of the Fisheries Research Board of Canada	J. Fish. Res. Board Canada	1953, 10, No. 6	Toronto, Canada
Journal of Genetics	J. Genetics	1953, 51, No. 3	Cambridge ; London, England
Journal of General Microbiology	J. Gen. Microbiol.	1953, 9, No. 1	London, England
Journal of General Physiology	J. Gen. Physiol.	1953, 36, No. 6	New York, U.S.A.
Journal of Gerontology	J. Gerontol.	1953, 8, No. 3	Ann Arbor, Mich., U.S.A.
Journal of Helminthology	J. Helminthol.	1953, 27, No. 1	London, England
Journal of Horticultural Science	J. Hortic. Sci.	1953, 28, No. 3	London, England
Journal of Hygiene	J. Hyg.	1953, 51, No. 3	London, England
Journal of Immunology	J. Immunol.	1953, 71, No. 2	Baltimore, Md., U.S.A.
Journal of the Indian Institute of Science	J. Indian Inst. Sci.	1953, 35, No. 3	Bangalore, India
Journal of the Indian Medical Association	J. Indian Med. Assoc.	1953, 22, No. 11	Calcutta, India
Journal of Infectious Diseases	J. Infect. Dis.	1953, 93, 1	Chicago, Ill., U.S.A.
Journal of the Institute of Brewing	J. Inst. Brewing	1953, 59, No. 5	Cambridge, England
Journal of Laboratory and Clinical Medicine	J. Lab. Clin. Med.	1953, 42, No. 1	St. Louis, Mo., U.S.A.
Journal of Laryngology and Otology	J. Laryngol. Otol.	1953, 67, No. 9	London, England
Journal of the National Cancer Institute	J. Nat. Cancer Inst.	1953, 14, No. 2	Bethesda, Md., U.S.A.
Journal of Neuropathology and Experimental Neurology	J. Neuropathol. Exp. Neurol.	1953, 12, No. 3	Baltimore, Md., U.S.A.
Journal of Neurophysiology	J. Neurophysiol.	1952, 15, No. 6	Springfield, Ill., U.S.A.
Journal of Nutrition	J. Nutrition	1953, 51, No. 1	Philadelphia, Pa., U.S.A.
Journal of Obstetrics and Gynaecology of the British Empire	J. Obstet. Gynaecol. Brit. Empire	1953, 80, No. 4	Altrincham, England
Journal of Organic Chemistry	J. Org. Chem.	1953, 18, No. 8	Baltimore, Md., U.S.A.
Journal of the Osaka City Medical Center	J. Osaka City Med. Center	1952, 2, No. 1	Osaka, Japan
Journal of the Oslo City Hospitals	J. Oslo City Hosp.	1953, 3, No. 9	Oslo, Norway
Journal of Parasitology	J. Parasitol.	1953, 39, No. 3	Lancaster, Pa., U.S.A.
Journal of Pathology and Bacteriology	J. Pathol. Bacteriol.	1953, 65, No. 2	London, England
Journal of Pediatrics	J. Pediat.	1953, 43, No. 2	St. Louis, Mo., U.S.A.
Journal of Pharmacy and Pharmacology	J. Pharm.	1953, 5, No. 10	London, England
Journal of Pharmacology and Experimental Thera- peutics	J. Pharmacol. Exp. Therap.	1953, 108, No. 4	Baltimore, Md., U.S.A.
Journal of the Pharmaceutical Society of Japan	J. Pharm. Soc. Japan	1953, 72, No. 7	Tokyo, Japan
Journal of the Philippine Medical Association	J. Philippine Med. Assoc.	1953, 29, No. 7	Manila, Philippines
Journal of Physical Chemistry	J. Phys. Chem.	1953, 57, No. 6	Easton, Pa., U.S.A.
Journal of Physiology	J. Physiol.	1953, 121, No. 3	London, England
Journal de Physiologie	J. Physiol., Paris	1953, 45, No. 2	Paris, France
Journal of the Royal Agricultural Society of England	J. Roy. Agric. Soc. Engl.	1952, 113	London, England
Journal of the Royal Army Medical Corps	J. Roy. Army Med. Corps	1953, 99, No. 2	London, England
Journal of the Egyptian Medical Association	J. Egypt. Med. Assoc.	1953, 36, No. 7	Cairo, Egypt
Journal of the Royal Institute of Public Health and Hygiene	J. Roy. Inst. Pub. Health Hyg.	1953, 16, No. 9	London, England
Journal of the Royal Sanitary Institute	J. Roy. Sanit. Inst.	1953, 73, No. 5	London, England
Journal of the Science of Food and Agriculture	J. Sci. Food Agric.	1953, 4, No. 9	London, England
Journal of Scientific Instruments and of Physics in Industry	J. Sci. Instruments	1953, 30, No. 9	London, England
Journal of Tropical Medicine and Hygiene	J. Trop. Med. Hyg.	1953, 56, No. 8	London, England
Kungl. Lantbruksakademiens Tidskrift	Kgl. Lantbruksakad. Tidskr.	1953, 92, No. 2/3	Stockholm, Sweden
Kitasato Archives of Experimental Medicine	Kitasato Arch. Exp. Med.	1952-53, 25, No. 3/4	Tokyo, Japan
Klinicheskaya Meditsina	Klin. Med., Mosk.	1953, 30, No. 11	Moscow, U.S.S.R.
Klinische Wochenschrift	Klin. Wochenschr.	1953, 31, No. 37/38	Berlin : Göttingen : Heidelberg, Germany
Konevodstvo	Konevodstvo	1953, No. 5	Moscow, U.S.S.R.
Kyushu Memoirs of Medical Sciences	Kyushu Mem. Med. Sci.	1952, 3, No. 2	Fukuoka, Japan
Le Lait	Lait	1953, 33, No. 326	Paris, France
Lancet	Lancet	1953, 265, No. 6786	London, England
Langenbecks Archiv für Klinische Chirurgie	Langenbecks Arch. klin. Chirurg.	1953, 275, No. 5/6	Berlin : Göttingen : Heidelberg, Germany
Il Lattante	Lattante	1953, 24, No. 6	Parma, Italy
Laval Médical	Laval méd.	1953, 18, No. 7	Quebec, Canada
Justus Liebig's Annalen der Chemie	Liebigs Ann.	1953, 582, No. 3	Weinheim, Germany
Maandschrift voor Kindergeneeskunde	Maandschr. Kindergeneesk.	1953, 21, No. 10	Leyden, Holland
Maataloustieteellinen Aikakauskirja	Maataloust. Aikakausk.	1953, 25, No. 2	Helsinki, Finland
Malayan Agricultural Journal	Malayan Agric. J.	1953, 36, No. 2	Kuala Lumpur, Federation of Malaya

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<i>Title of Journal</i>	<i>Contracted Title</i>	<i>Last Number Scrutinised</i>	<i>Place of Publication</i>
Manx Journal of Agriculture	Manx J. Agric.	1953, 7, No. 4	Peel, Isle of Man, England
Medical Journal of Osaka University	Med. J. Osaka Univ. (Engl. Ed.) (Jap. Ed.)	1953, 4, No. 1 1953, 5, No. 6	Osaka, Japan
Materiae Vegetabiles	Materiae vegetabiles	1953, 1, No. 3	The Hague, Holland
Medical Clinics of North America	Med. Clins. N. Amer.	1953, 37, No. 3	Philadelphia, Pa., U.S.A.
Medicina del Lavoro	Med. del Lavoro	1953, 44, No. 7	Milan, Italy
Medicamenta	Medicamenta	1953, 20, No. 242	Madrid, Spain
Medicine, Analytical Reviews of General Medicine, Neurology and Pediatrics	Medicine, Baltimore	1953, 32, No. 1	Baltimore, Md., U.S.A.
Medical Journal of Malaya	Med. J. Malaya	1952-53, 7, No. 4	Singapore, Federation of Malaya
Medical Officer	Med. Officer	1953, 90, No. 12	London, England
Médecine Tropicale	Méd. trop.	1953, 13, No. 4	Marseilles, France
Meldinger fra Norges Landbrukshøgskole	Meld. Norges Landbrukshøgsk.	1953, 33, No. 3	Oslo, Norway
Memórias do Instituto Oswaldo Cruz	Mem. Inst. Oswaldo Cruz	1952, 50	Rio de Janeiro, Brazil
Metabolism, Clinical and Experimental	Metabolism	1953, 2, No. 4	New York, U.S.A.
Methods in Medical Research	Methods in Med. Res.	1952, 5	Chicago, Ill., U.S.A.
Mie Medical Journal	Mie Med. J.	1952, 3, No. 1	Tsu, Japan
Mikrobiologiya	Mikrobiologiya	1952, 22, No. 3	Moscow, U.S.S.R.
Milbank Memorial Fund Quarterly	Milbank Mem. Fund Quarterly	1953, 31, No. 4	New York, U.S.A.
Mitteilungen aus den Gebiete der Lebensmittel- untersuchung und Hygiene	Mitt. Geb. Lebensmittel. Hyg.	1953, 44, No. 3	Basle, Switzerland
Molochnaya Promyshlennost	Mol. Prom.	1953, 14, No. 6	Moscow, U.S.S.R.
Monatsschrift für Kinderheilkunde	Monatsschr. Kinderheilk.	1953, 101, No. 9	Berlin : Göttingen : Heidelberg, Germany
Monthly Bulletin of the Ministry of Health and the Public Health Laboratory Service	Monthly Bull. Minist. Health and Pub. Health Lab. Serv.	1953, 12, Sept.	London, England
Münchener Medizinische Wochenschrift	Münch. med. Wochenschr.	1953, 95, No. 41	Munich, Germany
The Nagoya Journal of Medical Science	Nagoya J. Med. Sci.	1952, 15, No. 4	Nagoya, Japan
Nagoya Medical Journal	Nagoya Med. J.	1953, 1, No. 2	Nagoya, Japan
Nature	Nature	1953, 172, No. 4377	London, England
Die Naturwissenschaften	Naturwissenschaften	1953, 40, No. 17	Berlin : Göttingen : Heidelberg, Germany
Nederlands Melk en Zuiveltijdschrift	Nederlands Melk Zuiveltijdschr.	1953, 7, No. 1/2	The Hague, Holland
Nederlandsch Tijdschrift voor Geneeskunde	Nederland. Tijdschr. Geneesk.	1953, 97, No. 39	Amsterdam, Holland
New England Journal of Medicine	New Engl. J. Med.	1953, 249, No. 4	Boston, Mass.
New Zealand Journal of Agriculture	N.Z. J. Agric.	1953, 37, No. 1	Wellington, New Zealand
New Zealand Journal of Science and Technology	N.Z. J. Sci. Technol.	1953, 35, No. 1	Wellington, New Zealand
New Zealand Veterinary Journal	N.Z. Vet. J.	1953, 1, No. 5	Wellington, New Zealand
Nordisk Jordbrugsforskning	Nord. Jordbrugsforsk.	1953, 35, No. 1	Helsinki, Finland
Nordisk Medicin	Nord. Med.	1953, 49, No. 39	Stockholm, Sweden
Nordisk Veterinärmedicin	Nord. Vet. Med.	1953, 5, No. 8	Stockholm, Sweden
Norsk Landbruk	Norsk Landbruk	1952, No. 18	Oslo, Norway
North American Veterinarian	North Amer. Vet.	1953, 34, No. 9	Chicago, Ill., U.S.A.
Nutrition : Dietetics : Catering	Nutrition : Dietetics : Catering	1953, 7, No. 2	London, England
Onderstepoort Journal of Veterinary Research	Onderstepoort J. Vet. Res.	1953, 26, No. 1	Pretoria, South Africa
Ophthalmologica	Ophthalmologica	1953, 126, No. 4	Basle, Switzerland
Organic Reactions	Organic Reactions	1952, 7	New York, U.S.A.
Österreichische Zeitschrift für Kinderheilkunde und Kinderfürsorge	Öst. Ztschr. Kinderheilk.	1953, 9, No. 1	Vienna, Austria
Parasitology	Parasitology	1953, 43, No. 1/2	London, England
La Pediatria	Pediatria	1953, 61, No. 7/8	Naples, Italy
Pediatrics	Pediatrics	1953, 12, No. 2	Springfield, Ill., U.S.A.
Pédiatrie	Pédiatrie	1953, 42, No. 6	Lyons, France
Pediatrya	Pediatrya	1952, No. 5	Moscow, U.S.S.R.
Pflügers Archiv für die Gesamte Physiologie des Menschen und der Tiere	Pflügers Arch.	1953, 257, No. 4	Berlin : Göttingen : Heidelberg, Germany
Pharmaceutical Bulletin	Pharm. Bull.	1953, 1, No. 2	Tokyo, Japan
Pharmazeutische Zentralhalle für Deutschland	Pharm. Zentralhalle	1953, 92, No. 9	Dresden : Leipzig, Germany
Philippine Journal of Science	Philippine J. Sci.	1953, 81, No. 2	Manila, Philippines
Physiological Reviews	Physiol. Rev.	1953, 33, No. 3	Baltimore, Md., U.S.A.
Physiological Zoölogy	Physiol. Zoöl.	1952, 26, No. 3	Chicago, Ill., U.S.A.
Poultry Science	Poultry Sci.	1953, 32, No. 4	Menasha, Wis., U.S.A.
Practitioner	Practitioner	1953, 170, Sept.	London, England
Prensa Pediatrica	Prensa pediat.	1953, 4, No. 19/20	Buenos Aires, Argentina
La Presse Médicale	Presse méd.	1953, 61, No. 57	Paris, France
Priroda	Priroda	1953, No. 2	Moscow, U.S.S.R.
Problemy Tuberkuleza	Problemy Tuberk.	1952, No. 5	Moscow, U.S.S.R.
Proceedings of the American Association for Cancer Research	Proc. Amer. Soc. Cancer Res	1953, 1, No. 1	Chicago, Ill., U.S.A.
Proceedings of the Helminthological Society of Washington	Proc. Helminthol. Soc. Washington	1953, 20, No. 2	Washington, D.C., U.S.A.

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Proceedings of the Indian Academy of Sciences	Proc. Indian Acad. Sci.	1953, 38 , No. 1	Bangalore, India
Proceedings of the Japan Academy	Proc. Japan Acad.	1953, 29 , No. 5	Tokyo, Japan
Proceedings of the National Academy of Sciences	Proc. Nat. Acad. Sci., Washington	1953, 39 , No. 8	Washington, U.S.A.
Proceedings of the Nutrition Society	Proc. Nutrition Soc.	1953, 12 , No. 2	Cambridge, England
Proceedings of the Royal Society (Series B)	Proc. Roy. Soc. [B]	1953, 141 , No. 905	London, England
Proceedings of the Royal Society of Edinburgh [B]	Proc. Roy. Soc. Edinb. [B]	1952-53, 65 , No. 1	Edinburgh, Scotland
Proceedings of the Royal Society of Medicine	Proc. Roy. Soc. Med.	1953, 46 , No. 8	London, England
Proceedings of the Society for Experimental Biology and Medicine	Proc. Soc. Exp. Biol. Med.	1953, 83 , No. 3	New York, U.S.A.
Proceedings of the Staff Meetings of the Mayo Clinic	Proc. Staff Meetings Mayo Clin.	1953, 23 , No. 16	Rochester, Minn., U.S.A.
Public Health	Pub. Health	1953, 66 , No. 12	London, England
Public Health Reports	Pub. Health Rep., Washington	1953, 68 , No. 8	Washington, D.C., U.S.A.
Quaderni della Nutrizione	Quad. Nutrizione	1952, 12 , No. 4	Bologna, Italy
Quarterly Bulletin Michigan Agricultural Experiment Station	Quart. Bull. Michigan Agric. Exp. Stat.	1953, 36 , No. 1	East Lansing, Mich., U.S.A.
Quarterly Journal of Experimental Physiology	Quart. J. Exp. Physiol.	1953, 38 , No. 3	London, England
Quarterly Journal of Medicine	Quart. J. Med.	1953, 22 , No. 86	Oxford, England
Quarterly Journal of Microscopical Science	Quart. J. Microscop. Sci.	1953, 94 , No. 2	London, England
Quarterly Review of Agricultural Economics	Quart. Rev. Agric. Econ.	1953, 6 , No. 2	Canberra, Australia
Queensland Agricultural Journal	Queensland Agric. J.	1953, 77 , No. 1	Brisbane, Australia
Queensland Journal of Agricultural Science	Queensland J. Agric. Sci.	1952, 9 , No. 4	Brisbane, Australia
Recent Progress in Hormone Research	Recent Progr. in Hormone Res.	1953, 8	New York, U.S.A.
Recueil de Médecine Vétérinaire Publié par le Corps Enseignant de l'École d'Alfort	Rec. Méd. vét.	1953, 129 , No. 9	Paris, France
Recueil des Travaux Chimiques des Pays-Bas et de la Belgique	Rec. Trav. chim. Pays-Bas	1953, 72 , No. 8	Amsterdam, Holland
Recueil des Travaux de l'Institut National d'Hygiène	Rec. Trav. Inst. nat. Hyg.	1952, 4 , No. 2	Paris, France
Research	Research	1953, 6 , No. 9	London, England
Revista de la Asociación Argentina de Dietología	Rev. Asoc. argent. Dietologia	1952, 10 , No. 40	Buenos Aires, Argentine
Revista de la Asociación Médica Argentina	Rev. Asoc. méd. argent.	1953, 67 , No. 750	Buenos Aires, Argentine
Revue Belge de Pathologie et de Médecine Expérimentale	Rev. belg. Pathol. Méd. exp.	1953, 23 , No. 1	Brussels, Belgium
Revue Canadienne de Biologie	Rev. canad. Biol.	1952-53, 11 , No. 5	Montreal, Canada
Revista Clínica Española	Rev. clín. española	1953, 50 , No. 1/2	Madrid, Spain
La Revue d'Oka, Agronomie, Médecine Vétérinaire	Rev. d'Oka	1953, 27 , No. 5	Canada
Review of Economics and Statistics	Rev. Econ. Statistics	1953, 35 , No. 1	Cambridge, Mass., U.S.A.
Review of Economic Studies	Rev. Econ. Studies	1952-53, 20 , No. 3	Cambridge, England
Revue d'Élevage et de Médecine Vétérinaire des Pays Tropicaux	Rev. Élevage Méd. vét. Pays trop.	1953, 6 , No. 1	Paris, France
Revista Española de las Enfermedades del Aparato Digestivo y de la Nutrición	Rev. española Enferm. Apar. digest. Nutrición	1953, 12 , No. 3	Madrid, Spain
Revista Española de Fisiología	Rev. española Fisiol.	1953, 8 , No. 4	Barcelona, Spain
Revista Española de Pediatría	Rev. española Pediat.	1953, 9 , No. 51	Saragossa, Spain
Revista de la Facultad de Agronomía y Veterinaria	Rev. Fac. Agronom. Vet., Buenos Aires	1952, 13 , No. 2	Buenos Aires, Argentine
Revista Médica de Chile	Rev. méd. Chile	1953, 81 , No. 5	Santiago, Chile
Revista Médico-Quirúrgica de Oriente	Rev. méd.-quir. Orient.	1953, 14 , No. 1	Santiago, Cuba
Revista de Medicina Veterinaria	Rev. Med. vet., Buenos Aires	1952, 34 , No. 2	Buenos Aires, Argentine
Rhodesia Agricultural Journal	Rhodesia Agric. J.	1953, 50 , No. 2	Salisbury, Rhodesia
Rivista di Clinica Pediatrica	Riv. Clin. pediat.	1953, 51 , No. 6	Florence, Italy
Rivista dell'Istituto Sieroterapico Italiano	Riv. Ist. sieroterap. ital.	1953, 23 , No. 3	Naples, Italy
Rivista de Zootecnia	Riv. Zootec.	1953, 26 , No. 7/8	Milan, Italy
Roczniki Państwowego Zakładu Higieny	Rocz. Państwowego Zakł. Hig.	1953, 4 , No. 2	Warsaw, Poland
Sankhyā, Indian Journal of Statistics	Sankhyā, Indian J. Statistics	1953, 12 , No. 1/2	Calcutta, India
Sbornik Československé Akademie Zémědělské	Sborn. čsl. Akad. Zěméd.	1953, 26 , No. 4	Prague, Czechoslovakia
Schweizerische Medizinische Wochenschrift	Schweiz. med. Wochenschr.	1953, 83 , No. 41	Basle, Switzerland
Science	Science	1953, 118 , No. 3061	Baltimore, Md., U.S.A.
Scientific Proceedings of the Royal Dublin Society	Sci. Proc. Roy. Dublin Soc.	1953, 26 , No. 11	Dublin, Republic of Ireland
Scottish Agriculture	Scot. Agric.	1953, 33 , No. 1	Edinburgh, Scotland
Shikoku Acta Medica	Shikoku Acta Med.	1953, 4 , No. 1	Tokushima, Shikoku, Japan
Sotzialisticheskoe Zhivotnovodstvo	Sotzial. Zhiv.	1953, 14 , No. 10	Moscow, U.S.S.R.
South African Journal of Clinical Science	S. African J. Clin. Sci.	1953, 4 , No. 1	Mowbray, C.P., South Africa
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Southern Medical Journal	Southern Med. J.	1953, 46 , No. 9	Birmingham, Ala., U.S.A.
Sovetskaya Meditsina	Sovet. Med.	1953, No. 2	Moscow, U.S.S.R.
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Lo Sperimentale	Sperimentale	1953, 103 , No. 4	Florence, Italy
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Surgery, Gynaecology and Obstetrics	Surg. Gynecol. Obstet.	1953, 97 , No. 2	Chicago, Ill., U.S.A.
Tasmanian Journal of Agriculture	Tasmanian J. Agric.	1953, 24 , No. 2	Hobart, Tasmania
Terapevticheski Arkhiv	Terap. Arkh.	1953, 24 , No. 6	Moscow, U.S.S.R.
Tidsskrift for det Norske Landbruk	Tidsskr. norske Landbruk	1953, 60 , No. 3	Oslo, Norway
Tijdschrift voor Diergeneeskunde	Tijdschr. Diergeneesk.	1953, 78 , No. 18	Utrecht, Holland
Tohoku Journal of Experimental Medicine	Tohoku J. Exp. Med.	1953, 58 , No. 2	Sendai, Japan
Transactions of the Faraday Society	Trans. Faraday Soc.	1953, 49 , No. 9	Aberdeen, Scotland
Transactions and Proceedings of the Royal Society of New Zealand	Trans. Proc. Roy. Soc. N.Z.	1953, 81 , No. 1	Wellington, New Zealand
Transactions of the Royal Highland Society of Scotland	Trans. Roy. Highl. Agric. Soc. Scot.	1951, 63	Edinburgh, Scotland
Transactions of the Royal Society of Tropical Medicine and Hygiene	Trans. Roy. Trop. Soc. Med. Hyg.	1953, 47 , No. 4	London, England
Tropical Agriculture. The Journal of the Imperial College of Agriculture, Trinidad	Trop. Agric., Trinidad	1953, 30 , No. 6	St. Augustine, West Indies
Vestnik Otorinolaringologii	Vestn. Otorinolaringol.	1952, 14 , No. 6	Moscow, U.S.S.R.
Vestnik Venerologii i Dermatologii	Vestn. Venerol. Dermatol.	1952, No. 6	Moscow, U.S.S.R.
Veterinariya	Veterinariya	1952, 29 , No. 10	Moscow, U.S.S.R.
Veterinary Medicine	Vet. Med.	1953, 48 , No. 9	London, England
Veterinary Record	Vet. Rec.	1953, 65 , No. 38	London, England
Virchows Archiv für Pathologische Anatomie	Virchows Arch.	1953, 323 , No. 6	Berlin : Göttingen : Heidelberg, Germany
Vitamins and Hormones	Vitamins and Hormones	1952, 10	New York, U.S.A.
Vitamine and Hormone	Vitamine u. Hormone	1944-52, 5	Leipzig, Germany
Voeding	Voeding	1953, 14 , No. 9	Amsterdam, Holland
Wiener Klinische Wochenschrift	Wien. klin. Wochenschr.	1953, 65 , No. 38	Vienna, Austria
West Indian Medical Journal	West Indian Med. J.	1953, 2 , No. 3	Jamaica, B.W.I.
Yokohama Medical Bulletin	Yokohama Med. Bull.	1953, 4 , No. 1	Yokohama, Japan
Yorkshire Bulletin of Economic and Social Research	York. Bull. Econ. Social Res.	1953, 5 , No. 2	Hull, England
Zhurnal Analiticheskoi Khimii	Zh. Anal. Khim.	1953, 8 , No. 2	Moscow, U.S.S.R.
Zhurnal Obshchei Biologii	Zh. Obshchei Biol.	1952, 13 , No. 6	Moscow, U.S.S.R.
Zoologicheskii Zhurnal	Zool. Zh.	1953, 32 , No. 1	Moscow, U.S.S.R.
Zootechnia. Acta Societatis Internationalis Veterinariorum Zootechnicorum	Zootechnia	1953, 2 , No. 4	Madrid, Spain
Zootecnica e Veterinaria, la Fecondazione Artificiale	Zootec. Vet.	1953, 8 , No. 8	Milan, Italy
Zeitschrift für die Gesamte Experimentelle Medizin	Ztschr. ges. exp. Med.	1953, 121 , No. 2	Berlin : Göttingen : Heidelberg, Germany
Zeitschrift für die Gesamte Innere Medizin	Ztschr. ges. inn. Med.	1953, 8 , No. 16	Leipzig, Germany
Zeitschrift für Hygiene und Infektionskrankheiten	Ztschr. Hyg. Infektionskr.	1953, 137 , No. 5	Berlin : Göttingen : Heidelberg, Germany
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Zeitschrift für Kinderheilkunde	Ztschr. Kinderheilk.	1953, 73 , No. 4	Berlin : Göttingen : Heidelberg, Germany
Zeitschrift für Lebensmittel-Untersuchung und -Forschung	Ztschr. Lebensmittel-Untersuch. Forsch.	1953, 97 , No. 2	Munich, Germany
Zeitschrift für Physiologische Chemie (see Hoppe-Seyler's Ztschr.)			
Zeitschrift für Tropenmedizin und Parasitologie	Ztschr. Tropenmed. Parasitol.	1952, 4 , No. 3	Stuttgart, Germany
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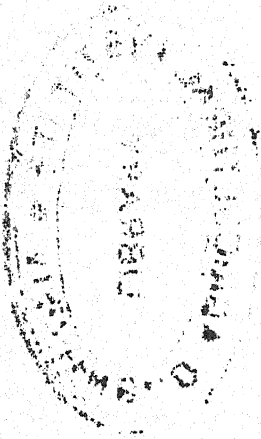
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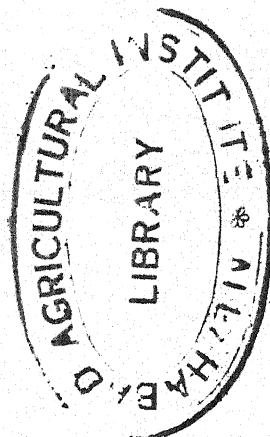
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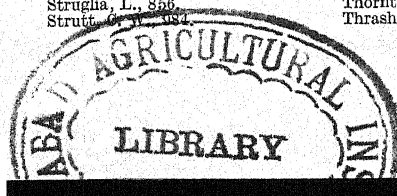
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THE DIAGNOSIS OF MALNUTRITION IN MAN

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INTRODUCTION

DURING the years 1937 and 1938 a team of workers from the Rowett Research Institute made a dietary and clinical survey in selected areas of Great Britain. One of the present authors (A. M. Thomson) was a member of the clinical team. The aim of this survey (the Carnegie United Kingdom Dietary and Clinical Survey) was to record the diets of families with children and to assess the health of the children in terms of a number of clinical signs thought to be indicative of "state of nutrition"; finally the validity of these assessments was to be tested by a second clinical examination of a proportion of the children after their diets had been improved for about a year by the addition of foods to provide nutrients judged to be in poor supply. A comprehensive report on the Survey is now almost ready for press and will show that, apart from somatometric measurements, the clinical data have completely failed to throw light on one of the original questions, namely, what are the clinical signs of imperfect nutrition in a population of children not suffering from either starvation or outright deficiency disease. Nearly fifteen years have passed since

the Carnegie Survey was made, and the barrenness of the clinical results makes it desirable to review knowledge of procedures for appraising state of nutrition by clinical signs and laboratory tests. A first glance at recent pronouncements is not encouraging. The U.S. National Research Council (1949) says: "It is not easy to recognise early nutritional deficiency disease by simple inspection", and again: "... the interpretation of the findings with these [chemical] methods, with respect to the adequacy of nutrition, remains fraught with difficulty".

Yet it is important that we should seek for means of determining when and how health is likely to be impaired by imperfect diet, or improved by better diet. The whole concept of physiological food requirements depends on accurate assessment of health in relation to diet. Orr's (1937) definition of an optimum diet is in general, not physiological, terms: "a diet which will keep people in health; and the standard of health adopted is a state of well-being such that no improvement could be effected by a change in the diet". What are the criteria of this state of well-being, and what signs and symptoms arise when it is not attained? Throughout this review, we shall

bear in mind the *health* of individuals and of populations, in relation to diet. The mere fact that an individual or a population is consuming a diet which fails to reach some theoretical standard of "adequacy" is not necessarily evidence that health is impaired.

Concepts and Definitions

The terms "diet" and "nutrition", or "deficiency" and "malnutrition", are often used unsystematically and interchangeably, even during the course of the same report. Sometimes it is difficult to understand what is meant, because concepts seem to be as ill defined as terms. We could cite many examples, but a few quotations from the first volume of the Proceedings of the Nutrition Society will suffice to indicate the point of view which was common during the war years. Harris (1944) wrote that "partial deficiencies were the cause of definite ill-health, even in the absence of obvious clinical signs or symptoms". What is "partial deficiency", and what is the evidence of "definite ill-health" when clinical signs and symptoms are absent? One possible answer comes from a subsequent paper by Sinclair (1944) who said "The earliest changes in deficiency states are changes in function only, and are difficult to detect clinically until structural changes supervene". Following Sinclair, Platt (1944) also subscribes to the hypothesis—little or no concrete evidence is presented—that impairment of function should be distinguished from impairment of structure, but in terms of degree rather than duration of deficiency: "assessments of state of nutrition should be made at two levels, a low level at which clinical signs of dietary deficiency could be distinguished, and a high or optimal level. The test used to establish the attainment of the upper level should be designed to measure performance." So far, so good; but it may be noted that evidence of functional impairment is assumed tacitly not to be *clinical* evidence, a concept to which not everyone would subscribe. According to Yudkin (1944) "even if deficiency has been proved, it may be the effect rather than the cause of the condition". The obscurity of this statement is not wholly dispelled by his illustrative example of "deficiency of vitamin C in tuberculosis". How this deficiency was "proved" is not stated.

It seems desirable to state the meaning attached to terms in this review. *Nutrition* is an abstract term covering the whole process of taking and utilising food. "*State of nutrition*" or "*nutritional status*" is a convenient comprehensive term referring to health (level of well-being, in terms of growth, function and structure) in relation to food and its utilisation. Nutritional status may be

affected not only by quantity and quality of food eaten but also by anomalies in the utilisation of food, and the effects on health may be identical. Thus, for example, a low level of haemoglobin in the blood may be due to simple deficiency of iron in the diet, or to a multitude of other causes, from loss of blood to severe infection. Some of the more recent discoveries are difficult to fit into any simple theoretical scheme of types of nutritional status; for example, although sprue may respond to folic acid therapy (Spies, 1947; Cohen, Meyer and Fadem, 1952) it is not necessarily associated with deficiency of folic acid in the diet. Again, impairment of nutritional status may result from the *presence* in the diet of some prejudicial substance, e.g., the hypothetical substance in maize which may produce pellagra by inhibiting the action of nicotinic acid (Chick, 1951). It is not our intention to analyse and rationalise all the possible pathways whereby nutritional status may be altered. Pett (1950) gives a long list of these. Our concern is with the effects on nutritional status produced by insufficient or deficient diets. The clinical phenomena of insufficiency alone, i.e., simple underfeeding on a carefully balanced diet, have been described by Keys *et al.* (1950) and will not be discussed separately.

There seems to be no term which is generally agreed to refer specifically to "the effects on nutritional status produced by insufficient or deficient diets". Sinclair (1948) revived the obsolete word "nutriture", meaning "condition as to nourishment". He divides "health" into "nutriture" and "non-nutritional disease"; but does not include "structural defects not affecting health" due to "past malnutriture" under "health", so that the clinical signs of old rickets presumably have nothing to do with "nutriture". Earlier Dann and Darby (1945) used the word "nutriture", with acknowledgements to Sinclair, apparently quite interchangeably with "nutritional status". The introduction of the word seems to have done little except add to the confusion of an already confused terminology.

We think that the following series of definitions and concepts, though arbitrary, is at least simple and reasonably logical:

1. Well fed persons eating an *adequate diet* are in a *good state of nutrition*, provided the utilisation of food is not impaired.
2. Underfed persons eat an *insufficient diet* (insufficient in quantity) and develop the signs of *underfeeding*.
3. Malnourished persons eat a *deficient diet* (deficient in one nutrient or more) and develop the signs of *malnutrition*.
4. Signs of malnutrition or underfeeding follow, respectively, the taking of a deficient or

insufficient diet after a variable prodromal period, and some signs may persist if the diet again becomes adequate. We make no formal distinction between signs of present and past malnutrition. A knowledge of which signs indicate present, and which past, malnutrition is essential to the proper diagnosis of the current state of nutrition.

5. Evidence of underfeeding or malnutrition must be clinical, *i.e.*, impairment of growth, function or structure. On natural diets, underfeeding and malnutrition usually occur together.
6. Clinical signs identical with those of malnutrition may be produced by disease, metabolic abnormalities and other causes. The term "conditioned malnutrition" may be used to differentiate such types. This term is widely used. The equivalent term "conditioned underfeeding" would be appropriate for, say, *anorexia nervosa*.

The word "malnutrition", used in this way, needs further discussion. Severe degrees of malnutrition are usually labelled "deficiency disease". The term "latent (or subclinical) malnutrition" has been used to denote a state of health wherein no clinical defect is apparent even though the diet is believed to be deficient. It could be used to describe the prodromal phase of deficiency disease, but is usually employed with reference to a hypothetical stable state of impaired health between a good state of nutrition and deficiency disease. "Latent malnutrition" is thought to be detectable from the presence of a so-called "biochemical lesion", *i.e.*, a level of some nutrient or metabolite supposedly incompatible with continued good health, or a level believed to indicate low "nutritional reserves". Much confusion has been caused by validating such "biochemical lesions" in terms of concepts without any proven relationship with health, *e.g.*, "saturation of the tissues".

One more complication needs to be mentioned, and that is that the significance of clinical signs and symptoms may vary with the population under consideration. It is well known that body size, energy expenditure, atmospheric temperature and probably the presence or absence of endemic disease may influence requirements of energy or of nutrients, in respect of both the level at which reserves are stabilised and the intakes at which signs of underfeeding or malnutrition may arise. The general composition of the diet may affect the levels at which specific types of malnutrition become apparent. Even with so apparently simple a phenomenon as hunger (not chronic underfeeding or starvation) there may be great differences of significance. T. E. Lawrence (1935) wrote in "Seven Pillars of Wisdom": "The

assiduous food-habit of a lifetime had trained the English body to the pitch of producing a punctual nervous excitation in the upper belly at the fixed hour of each meal: and we sometimes gave the honoured name of hunger to this sign that our gut had cubic space for more stuff. Arab hunger was the cry of a long-empty labouring body fainting with weakness."

It should be noted particularly that the concept of dietary deficiency used throughout this review is associated with impairment of growth, function or structure, which impairment we call "malnutrition". The point is stressed because many authors use the term "deficiency" to connote either an intake below some arbitrary standard of adequacy or an intake which fails to meet the requirements of some arbitrary biochemical criterion. In neither instance is there necessarily any connection with health. We except metabolic studies showing continued negative balances from the category of "arbitrary biochemical criteria" since such balances must inevitably, in the long run, result in some impairment of growth, function or structure. In this review, we are restricting the term "malnutrition" to impairments associated with dietary deficiencies, although the Joint FAO/WHO Expert Committee on Nutrition (1951) says: "Malnutrition may . . . also result from excessive food intake".

A comprehensive review of the literature has not been attempted; references have been selected to illustrate the main facts and arguments.

CRITERIA OF SPECIFIC DEFICIENCY STATES

The Proximate Constituents

Little is known about possible specific effects of insufficiency of fat or carbohydrate in the diet. Since both take part in body structure and function, as well as contributing to the energy supply, simple inanition is not likely to be the only effect.

The only experimental trial of a diet providing less than 2 g. fat daily on a human adult was without demonstrable injurious effects over a period of 6 months. In fact, the subject was less prone to fatigue and ceased to suffer from migraine (Brown, Hansen, Burr and McQuarrie, 1938). Some inconclusive experiments on infants have been summarised by Sinclair (1952). A low carbohydrate intake in association with a high-fat diet would, of course, be expected to cause ketosis, but no recorded naturally occurring diet contains so much fat and so little carbohydrate and protein as to be ketogenic. The requirement of vitamin B₁ rises in proportion to the total amount of carbohydrate and protein to be metabolised, but, strictly speaking, excess of carbohydrate can exist only in relation to energy expenditure and obesity. Knowledge of human requirements of individual

fatty acids is fragmentary and unsatisfactory. Keys *et al.* (1950) recorded the appearance of dry and scaly skin, associated with follicular hyperkeratosis, during experimental underfeeding. This may possibly be due to removal of fat from the skin. As is noted below, subcutaneous fat is not removed in protein malnutrition.

The Joint FAO/WHO Expert Committee on Nutrition (1953) uses the term protein malnutrition "to indicate in general a state of ill-health occurring where diets are habitually poor in protein, while they are more adequate in calories. . . . The concept includes the effects of deficiency in the quantity of protein consumed, of imbalance of amino-acids, and deficiency of factors, such as vitamin B₁₂, commonly found in foods in association with animal protein and concerned with protein metabolism." Kwashiorkor, of which the chief cause is thought to be lack of protein, is described thus: "The main clinical features are failure of growth, retarded development, wasting of muscles, loss of appetite, mental apathy, oedema, dyspigmentation of hair and skin, diarrhoea, and the presence of undigested food in the stools. Subcutaneous fat is often well retained. There may be signs of associated vitamin deficiency. In the blood there is a reduction in the concentration of albumen and of certain enzymes." Post-mortem findings are: "fatty infiltration of the liver and atrophy of the pancreas and of other glands concerned with exocrine secretion, together with a diminution in the amount of pancreatic enzymes in the duodenal juice". See also Waterlow (1948) and Brock and Autret (1952).

Kwashiorkor may occur with energy deficiency of greater or less degree and it may be difficult to distinguish the signs of protein malnutrition from those of underfeeding, especially in severe cases. The levels of the plasma proteins appear to be insensitive indicators of protein malnutrition. In the Minnesota underfeeding experiment, there was no true reduction in plasma total protein or albumin. Keys *et al.* (1950) conclude that "the plasma protein level, as such, is of dubious merit in evaluating a person's nutritional status, at least in so far as that pertains to the protein stores in the body. A low plasma protein level, especially one in which the decrease is due primarily to a change in the albumin fraction, may indicate that the person has suffered from a dietary protein deficiency or an insufficient calorie intake. . . . There are, however, many normal persons in good nutritional status who may have protein levels comparable to those exhibited by semi-starved persons."

Experimental studies of single amino-acid deficiencies in man are in an early stage of development, and so far loss of weight among infants, associated with negative nitrogen balances, has been found to follow experimental deficiencies of

tryptophan, isoleucine, lysine and sulphur amino-acids lasting for 7 to 10 days (Albanese, 1952). In healthy young men deprived of valine for 4 days or of methionine for 6 days there were "profound failure in appetite, a sensation of extreme fatigue, and a marked increase in nervous irritability" (Rose, Johnson and Haines, 1950). It is not known whether such specific amino-acid deficiencies arise with natural dietaries, but this seems on the whole unlikely, unless perhaps where deficiency of tryptophan may arise on a predominantly maize diet and help to precipitate pellagra.

In general, then, it would appear that specific malnutrition due to shortage of fat or carbohydrate has not been described and the only specific consequence of protein deficiency known to exist is outright deficiency disease. Combined deficiencies of the proximate constituents of diet do, of course, produce underfeeding and such non-specific effects as impairment of growth.

Calcium, Phosphorus and Vitamin D

It is convenient to consider these three nutrients together. The deficiency diseases with which they are associated are rickets and osteomalacia.

The British Paediatric Association (1944) said that "most observers are agreed that the severe type of rickets with deforming bone changes has almost disappeared from Great Britain and with this disappearance the clinical conception of rickets must undergo some modification", which suggests that the old name is being transferred to less severe and perhaps even different conditions. The Association, in war time, studied "essentially healthy children in whom ricketty changes were likely to be minimum rather than maximum". Most of the children were aged under 2 years. The Report concludes that "in the severe types the clinical diagnosis of rickets is usually easy, in the milder forms extremely difficult and in the minor degrees of bony change quite impossible".

Radiological methods of diagnosis are not much better. In the survey cited above, "the correlation between the clinical and radiological diagnosis was very poor in Great Britain where only a small proportion of the clinically positive cases were confirmed radiologically", whereas "clinical methods of diagnosis failed to pick out half of the cases of active rickets diagnosed by radiology". These discrepancies might be dismissed on the basis that deformities may persist after healing and that it is impossible, except by radiography, to detect slight deformity of an epiphyseal line, but the table which details the findings of the radiologists who reported independently on the same films shows that there was considerable disagreement between them. This may be a matter of interpretation. Jeans (1936) showed that rickets

may be diagnosed, on the basis of X-ray films, in babies having abundant vitamin D and high retentions of calcium and phosphorus where the changes are "merely concomitants of rapid normal growth". Or it may be the more general question of observer error from which radiologists in other fields are not immune (*Lancet*, 1954).

Radiological observation of ossification pattern has been used in the study of disturbances of ossification. Schmid (1949), working in Germany, found that rickets now causes delay of ossification only in a minority of infants. Part of the variability in rates of ossification may be associated with variation in growth and development generally, *i.e.*, may be a general rather than a specific characteristic of malnutrition. This aspect will be dealt with later (p. 14).

The observation that serum alkaline phosphatase increases early in rickets and parallels the activity of the disease and the healing process gave hope that estimation of the enzyme would be of value for diagnosing minor deficiency states, especially in young children among whom other causes of a rise are less usual. According to the U.S. National Research Council (1949), "The value of including phosphatase determination in surveys other than those involving infants and young children remains to be determined", but even in young children and infants it must remain in doubt until early rickets has been better defined in radiological and clinical terms.

There is no change in blood serum calcium characteristic of rickets and, although serum inorganic phosphorus appears to be consistently low in untreated rickets, it may not respond to treatment, or it may respond rapidly and remain normal whether healing progresses or not (Medical Research Council, 1932; Bodansky and Jaffe, 1934). Therefore its practical value in diagnosis is doubtful.

Accounts of hunger osteomalacia in central Europe after the first World War and of osteomalacia associated with such abnormal social customs as *purdah* in the Far East (Medical Research Council, 1932), the one attributed to acute and the other to chronic deficiency of calcium and vitamin D, do not throw any light on the early diagnosis of mild deficiencies in more normal circumstances. The same may be said of Danish accounts of severe osteoporosis with pain and deformity, described by Meulengracht and Meyer (1937) and Meulengracht (1939) as due to poor diet in subjects with or without achylia, or to abuse of laxatives. The study of Owen, Irving and Lyall (1940), which showed the existence of generalised osteoporosis without sign or symptom in old men on poor diets, also showed that calcium and phosphorus equilibrium could exist on low intakes with the extremely low reserves indicated by osteoporotic bone. Hence even metabolism gave no

indicative evidence of deficiency and only deliberate search and radiography could provide a diagnosis.

Bernard (1952) has found contraction and flattening of the pelvic brim in both men and women of short stature, especially those in poor general health and from a poor social background. This contracted pelvis is associated, among women, with a high incidence of difficult labour due to disproportion, and may be regarded as a deformity of sub-rachitic type. The age at which the contraction occurs is not known.

Research on the structure, composition and health of teeth goes on continuously and we make little progress towards relating the epidemiology of dental caries in man to his general health or his diet. The caries experience of the healthy public school boy is in no respect different from that of the average council school boy (Carnegie Survey) and all that distinguishes them is the extent and quality of dental care. There are strange local differences in the structure and health of teeth, differences which have every appearance of being related to diet; but it is not only one diet or one type of diet that is associated with good teeth, and the presence of excellent teeth is by no means always associated, in either racial groups or individuals in one group, with good health. Indeed, the only concrete evidence on any considerable scale of simultaneous improvement of general health and reduction of dental caries comes from the experience of the recent war (Bransby and Knowles, 1949; Toverud, 1949). It is sometimes thought that the diminution in caries experience may have been related to sugar rationing. For diagnosis of malnutrition or of state of health, the degree of caries experience is of no help whatever.

Iron

It is generally accepted that deficiency of iron in the diet can produce hypochromic anaemia, but there is more doubt about the value of measurement of haemoglobin level as an index of the nutritional status of populations. The Carnegie Survey failed to show any differences in average haemoglobin level among children in different food expenditure groups; the data as a whole agreed very well with those of the survey of haemoglobin levels among schoolchildren in 1943 by the Medical Research Council Committee on Haemoglobin Surveys (1945), when, presumably, nutritional levels were if anything higher than in 1937-1938. The authors of the Medical Research Council report make no general conclusion on the existence or interpretation of differences in haemoglobin levels between different economic groups. Instead they emphasise the technical difficulties of obtaining reliable values even with a team of experts who had been subjected to a test

of accuracy and who used calibrated apparatus. It seems clear that a haemoglobin survey is by no means a light undertaking and that results will not reflect sensitively such differences in diet as may exist among a population like that of Great Britain.

The U.S. National Research Council bulletin (1949) says that "Determination of serum iron should prove to be a most useful procedure in the assessment of nutritional status". On the other hand, it also notes that "Low serum iron is not pathognomonic of iron deficiency".

Vitamin A

It is well known that vitamin A goes through the vitamin A-rhodopsin-retinene-vitamin A cycle during the adaptation of the retina to darkness and to light. According to Wolbach and Bessey (1942), characteristic changes of the epithelium occur in vitamin A deficiency, namely, keratinising metaplasia in the salivary glands, the respiratory tract, the genito-urinary tract, the eyes, and (in man) the skin and hair follicles. The role of vitamin A in dark adaptation fits the observation that clinical night blindness, curable by vitamin A, may occur among severely depleted populations; it has been held also that characteristic hyperkeratotic lesions of the skin and hair follicles may occur in severe and long-continued vitamin A deficiency (Frazier and Hu, 1931; Nicholls, 1935).

The Medical Research Council (1949) reported on an investigation in which 16 deprived and 7 other volunteers subsisted for not less than 6½ months on a daily diet providing less than 500 I.U. of carotenoids. The latter received carotene supplements. Eleven of the volunteers, 9 in the deprived group and 2 others, took the diet for from 20 to 25 months. Two of the deprived subjects thought that they became slightly night blind. These two and one who did not complain of clinical night blindness showed raised rod thresholds, but "only one of the three subjects showing a raised threshold with the Wald instrument gave abnormal readings with the Craik adaptometer". Suggestions are made (p. 47) about possible reasons for this difference. Whether the explanation lies in the techniques used or in the subjects' use of "the most efficient part of the retina", the fact remains that they had already been on a diet almost free from vitamin A for 10, 12 and 20 months when the first deviation from normal was found.

Rod scotometry showed that "two of the subjects whose final rod threshold was definitely raised showed also grossly abnormal fields of vision. In some subjects abnormal fields of vision seemed to be the only feature associated with vitamin A deficiency."

Clinical examination was equally unrewarding. "The great majority of clinical examinations

revealed no significant differences between the deprived and non-deprived group, or in the same person before and after deprivation of vitamin A. This applied to the biomicroscopical appearance of the cornea and conjunctiva, the blood picture including platelet counts, gastro-intestinal abnormalities, and the incidence of colds and coughs. The only signs and symptoms which seemed to be commoner in the deprived group, though their significance was doubtful, were dryness of the skin and eye discomfort. Audiometry, however, showed a significant worsening of hearing in the deprived group. In several of the subjects follicular hyperkeratosis was present at the start and varied during the experiment, but the variations bore no relation to the vitamin A intake." It is of interest that the clinical and histological characteristics of the hyperkeratosis were similar to those of the condition found in starvation by Keys *et al.* (1950) and in experimental vitamin C deficiency by the Medical Research Council (1953). In the vitamin A deficiency experiment, estimations of blood carotenoid content showed an average fall from 150 I.U. to about 40 I.U. per 100 ml. within 3 months, most of the residual carotenoid content consisting of substances other than α - and β -carotene. "No other effect which could definitely be ascribed to the deficient diet occurred during the first eight months." The average plasma value for vitamin A of the deprived group during the first 2 months on the diet was 88 I.U. per 100 ml. (a "normal" value of about 120 I.U. is proposed, on the basis of other data); after about 8 months "a definite downward trend was shown in ten out of the sixteen volunteers in the group. The fall became very pronounced in four men who eventually reached levels below 50 I.U. vitamin A per 100 ml. . . . One man, however, showed no appreciable drop even after twenty-two months of deprivation."

Thomson *et al.* (1939) had earlier investigated the use of dark adaptation in evaluating the nutritional status of British schoolchildren in respect of vitamin A. Using a specially designed adaptometer and a technique which yielded reproducible results on subjects irrespective of previous exposure to light, they found no relationship between the time taken to reach the rod threshold and the vitamin A content of the family diet. A few subjects with impaired dark adaptation were found and studied; their condition was not caused by dietary deficiency of vitamin A, but was cured by injecting large doses of the vitamin intramuscularly and was presumably due to some metabolic abnormality. The Medical Research Council volunteer experiment indicates that these findings were reliable, and it is noteworthy that tests of dark adaptation seem now to have fallen out of use in surveys of nutritional status.

Follicular hyperkeratosis likewise seems to have little or no value as an indication of vitamin A deficiency (Stannus, 1945). The Medical Research Council's experiment suggests that the same is true for eye signs, such as xerophthalmia. Kruse (1941) claimed that biomicroscopical examination of the conjunctiva is a sensitive method of determining the existence of slight or early vitamin A deficiency, but this is not borne out by the experimental work referred to above. In the report of the Medical Research Council experiments, it is stated that the buccal cavity was examined, but no results are given. There seems to be little information on human mucous membranes in vitamin A deficiency. Gerrie (1944) reported that nasal sinusitis among Aberdeen children was found to be associated with metaplasia of the epithelium in a small percentage of cases, and that oral or parenteral vitamin A treatment reduced the proportion going on to the suppurative stage. It is not known whether these cases were associated with any marked dietary deficiency of vitamin A, but this is unlikely.

Estimations of vitamin A and carotene levels in blood appear to yield little exact information. As the Medical Research Council experiment showed, subsistence on a diet containing minimum amounts of carotenoids and almost no preformed vitamin A resulted in a fairly rapid (2 to 3 months) fall to about 40 I.U. per 100 ml. in the plasma carotenoid levels, and a more erratic and less marked fall in plasma vitamin A. The U.S. National Research Council (1949) said "It seems apparent that there is a relationship between the amount of vitamin A and carotene in the blood and clinical evidence of vitamin A deficiency, but wide individual variations occur and a given level should be interpreted with caution. . . . In summary, a low level of vitamin A in the blood may mean vitamin A deficiency, decreased reserve stores, or the presence of some disease which affects vitamin A metabolism . . . low levels suggest deficiency but should be correlated with other findings for definite diagnosis." As already shown, these "other findings" themselves present no small difficulty of interpretation.

Vitamin B Complex

The members of the vitamin B complex have many roles in connection with the enzymes and co-enzymes governing the oxidation-reduction processes of intracellular metabolism. To what extent their functions may overlap or supplement one another is by no means clear, but meantime it seems possible that the role of each vitamin is not wholly peculiar to itself and independent of the roles of all the others. To relate the known biochemical functions of any given vitamin to its effect on physiological processes and on health is

as yet difficult because, as Peters pointed out in 1946, "chemistry and biochemistry have rushed ahead lately and . . . true nutritional work takes rather longer to do, because it involves physiology". The requirements of B vitamins are thought to be related to metabolism of carbohydrate, and this is certainly true of vitamin B₁, so that its requirement rises with the non-fat calories of the diet, and deficiency tends to be more common when energy expenditure is high.

Vitamin B₁

The classical deficiency disease is beriberi, which was recently experienced by many European prisoners of war in Japanese prison camps. Smith (1946) reported that in Hong Kong "there was nothing unusual about the clinical picture of these cases, in which there was oedema with the neurological manifestations, except that serious cardiac involvement was not common. The onset followed acute bacillary dysentery in 55 per cent. of the dysentery cases." The disease was controlled by the administration of 3 mg. crystalline vitamin B₁ every other day, and the response of established cases to treatment with the synthetic vitamin was "uniformly satisfactory". Burgess (1946) showed that the occurrence of beriberi in Singapore was related to the vitamin B₁ content of the diet. "In the first three years vitamin B₁ deficiency manifested itself in the form of oedematous, cardiac, and neuritic beriberi and as Wernicke's encephalopathy." It "appeared in about six weeks on a daily intake of 0.2 mg. per 1000 non-fat Calories (N.F.C.) or a total intake of 0.39 mg., and fresh cases ceased to occur when the daily intake rose to 0.5 mg. per 1000 N.F.C. or a total of 1.2 mg.". Cruickshank (1946) gives the following criteria for the diagnosis of vitamin B₁ deficiency:

- (1) Neurological manifestations
 - (a) Definite subjective and objective sensory changes;
 - (b) Muscular weakness and aching, with reflexes markedly diminished or absent;
 - (c) Wernicke's encephalopathy, *i.e.*, vomiting associated with nystagmus, paralysis of the external muscles of the eye and mental confusion.
- (2) Cardiovascular manifestations
 - (a) Oedema which cannot be attributed to nephritis, valvular disease of the heart, venous obstruction, or protein deficiency;
 - (b) Tachycardia with cardiac enlargement, alterations in the heart sounds and the appearance of murmurs without obvious cause.

"A diagnosis of vitamin B₁ deficiency was made if the findings fell under any one of the above subheadings. Usually, however, more than one of these signs were present in a given case."

Williams and others (1940 ; 1942 ; 1943) recorded the effects of experimental vitamin B₁ deficiency among human subjects. In their three experiments intake varied from 0.15 mg. to 0.45 mg. daily. The symptomatology was, on the whole, quite unspecific. In the first experiment, involving the most severe deficiency, "the abnormalities ultimately noted in all of the subjects who were deprived of thiamine for periods of several weeks were : depressed mental states, generalised weakness, dizziness, backache, soreness of muscles, palpitation, dyspnea and precordial distress (pseudo-angina) on exertion, insomnia, anorexia, nausea, vomiting, loss of weight, atony of muscles, very slight roughness of the skin, faint heart sounds, lowered blood pressure and bradycardia when at rest, with tachycardia and sinus arrhythmia on exertion. In all cases physical activity greatly decreased. Less regularly there were observed states of apathy, reawakening of psychotic trends [the subjects were, it appears, "recovered" mental patients], difficulty of thought and memory, photophobia, headache, abdominal distension, sensations of cold and heat, burning of the soles of the feet, numbness of the legs, fatigue of the ocular muscles, tenderness of the muscles of the calves and depressed tendon reflexes." All signs and symptoms disappeared when the pure vitamin was administered. It may be noted that the experiment did not include an independent control series. The clinical insignia, which are described as those of "true neurasthenia" progressing to *anorexia nervosa*, are obviously of little value in diagnosing early vitamin B₁ deficiency ; the authors (1940) note that "another conclusion suggested by our observation is that the isolated withdrawal of thiamine does not produce beriberi".

In the 1943 experiment of Williams *et al.*, the amount of vitamin B₁ excreted with and without a test dose of the vitamin decreased steadily during the experiment (intake 0.2 mg. daily for 120 days, with a test dose of 1.0 mg. about every second week) while the concentration in the blood of glucose, and of lactic and pyruvic acid after glucose administration, increased, these last changes beginning to show about the 50th day. The U.S. National Research Council (1949), reviewing the literature, found excretion of vitamin B₁ in the urine, with or without a test dose, to be of doubtful value in assessing nutritional status. "Pyruvic acid determinations during fasting, after glucose, or after exercise are useful in evaluating thiamine nutrition, particularly in individuals. These methods require considerable care, are time-consuming, and are not readily applicable to surveys. Furthermore, many pathological conditions other than thiamine deficiency are associated with a rise in pyruvic acid in the blood." It seems fair to conclude that no biochemical method of assessing

vitamin B₁ deficiency has yet attained any degree of reliability or specificity.

Riboflavin

No clinical state attributed to riboflavin deficiency was described before the demonstration by Sebrell and Butler (1938) that 10 out of the 18 women maintained for 94 to 130 days on a diet of cornmeal, cowpeas, lard, casein, flour, white bread, chalk, cod liver oil and tomato juice, with supplements of iron and vitamins B₁ and C, developed a lesion of the lips which was called "cheilosis". It was cured by pure riboflavin. That the diet used did not produce a pure riboflavin deficiency is shown by the fact that one subject developed pellagra and was cured by nicotinic acid. Soon afterwards (Oden, Oden and Sebrell, 1939) 3 women were found in rural Georgia with lesions similar to those which appeared in the trial, and they were cured by riboflavin. Ten years later Horwitt and colleagues (Horwitt *et al.*, 1948, 1949 ; Hills *et al.*, 1951) made a controlled trial of experimental riboflavin deficiency on 15 men ; the experimental diet contained 0.55 mg. of the vitamin and was judged to be complete in other respects. After 4½ months the subjects developed changes in the skin, including patchy seborrhoea of the scalp and chest, scrotal dermatitis, angular stomatitis, cheilosis and fissuring of the *alae nasi*. Scrotal dermatitis was the commonest lesion and with one exception responded, like the other skin lesions, to the administration of riboflavin. No circumcorneal injection, vascularisation of the cornea, or tongue change was seen.

Riboflavin deficiency has frequently been observed in the field since Oden, Oden and Sebrell's original case reports. Skin lesions are usually noted, but glossitis is usual also. For example, Hou (1944) describes characteristic patches of bluish-red or magenta discolouration with flattened, or scattered prominent, papillae. Jones *et al.* (1944) described an outbreak of stomatitis among men of mixed race in a camp in North Africa, subsisting on a diet containing about 1.0 mg. riboflavin daily ; the stomatitis was curable by Marmite or riboflavin. Thomson and Freedman (1947) described a similar outbreak among Indian troops. The presenting symptoms were sore throat, hoarseness and dysphagia, and on examination all cases were found to have a characteristic glossitis, in which stripping of the fur and epithelium occurred at the edges and tip of the tongue, leaving smooth, dark red or magenta areas ; in a later stage stripping of the epithelium was complete. Variable proportions of the men examined showed fissuring of the tongue, rhinitis, cheilosis, angular stomatitis, macroscopic "vascularity" of the cornea, maceration of the buccal

mucous membrane, and proctitis. Only one was found with scrotal dermatitis. All signs and symptoms cleared on treatment with yeast or pure riboflavin. That mental changes occur in riboflavin deficiency is shown by the following passage: "The men were somewhat depressed, apathetic and lethargic . . . from the unit officers' point of view the situation was readily accounted for by 'staleness' and they saw no cause for alarm. . . . Among these men, treated with riboflavin or yeast, a remarkable improvement in mental condition was evident, which was all the more noticeable by contrast with those in other [control] groups, who remained listless and morose." Jones *et al.* (1944) say of their subjects: "As early as the second day [of treatment] they became full of thanks, which is the more remarkable because these people are usually grudging in their gratitude".

Thomson and Freedman (1947) suggest that the rather variable clinical picture of riboflavin deficiency may be explained in terms of a "wear and tear mechanism". "The tongue, lips, buccal mucous membrane, soft palate, pharynx and epiglottis, nose, anus and lower rectum and scrotal skin (and, perhaps, the eyes) all have one feature in common—the epithelium is exposed to a relatively greater degree of wear and tear than other epithelial surfaces. Under normal conditions, regeneration keeps pace with wear and tear. In riboflavin deficiency, interference with cell metabolism impedes epithelial regeneration, and failure to keep pace with destruction occurs first at those sites where wear and tear are greatest. Individual differences of wear and tear may, perhaps, explain variations in symptomatology from case to case."

Biomicroscopical examination of the corneal limbus has had a vogue as a diagnostic method in mild or early riboflavin deficiency. Bessey and Wolbach (1939) found vascularisation of the cornea as an early sign of riboflavin deficiency in the rat, and Kruse *et al.* (1940) reported human keratitis responding to riboflavin therapy. Tisdall, McCreary, and Pierce (1942) reported that marked vascularisation of the cornea was found in Canadian aircrews and disappeared when large doses of riboflavin were given, but they later modified their conclusions (McCreary, Nicholls and Tisdall, 1944). About the same time Sandstead (1942) questioned whether superficial vascularisation of the cornea can be used as a diagnostic sign of riboflavin deficiency, but Stern, in 1950, thought the reverse, provided the deficiency was long-standing. The position is therefore somewhat confused but, in general, it seems true to say that this method of diagnosis has fallen out of favour.

There is no doubt that the signs and symptoms of riboflavin deficiency can arise in persons whose diet is adequate. Machella and McDonald (1943) have reported a series of "typical" cases which

failed to respond to synthetic riboflavin; some improved on treatment with brewer's yeast or other components of the vitamin B complex. One of the present authors (A. M. Thomson) has seen typical mouth signs in individual Indian soldiers persist despite long subsistence on an adequate diet with liberal supplements of milk.

Biochemical methods of assessing riboflavin deficiency have been widely studied, but few have related measurements to clinical condition. During experimental deficiency, urinary excretion of riboflavin falls, but there is considerable disagreement on the biochemical findings which indicate deficiency, and whether fasting excretion or load tests yield the more informative results (U.S. National Research Council, 1949).

Nicotinic Acid

Neither experimental production of pellagra nor field observation has yielded criteria by which the preliminary stages of deficiency may be identified.

Goldsmith *et al.* (1952) gave seven women suffering from psychoneurosis a diet low in vitamin B complex and supplemented by pure vitamins except nicotinic acid. The diet contained about 7.0 g. nitrogen, 4.7 mg. nicotinic acid, and 190 mg. tryptophan. No clinical sign of nicotinic acid deficiency was seen in two subjects who received the diet for 42 days, but clinical signs of pellagra developed between the 50th and 60th day in three who consumed the diet for 81, 117 and 135 days in all. The signs included mental depression, dermatitis, diarrhoea and inflamed tongue. Angular stomatitis appeared in two of the subjects who were receiving about 2 mg. riboflavin daily. Treatment with 30 mg. daily of nicotinamide in the diet was followed by subjective improvement within 24 to 48 hours; one month was required for complete healing of the dermatitis.

Sydenstricker (1941), writing with a wide knowledge of pellagra as seen in the Southern States of America, said: "In the chronic partial deficiency of B vitamins which finally results in the syndrome of pellagra, the symptoms and signs of nicotinic acid deprivation are prominent. Mild psychic disorders may precede other manifestations by weeks or months. Neurasthenic complaints of all sorts are common. Slight mental retardation, loss of memory for recent events, apprehension, confabulation, depression or mild delusional states may recur for months or years. Partial deafness, particularly for high pitched tones, may be the presenting symptom. Digestive disturbances, particularly gastric discomfort after meals, burning of the esophagus and stomach, flatulence and constipation are almost invariable, anorexia is very apt to develop, with decreased intake of all sorts of food. Soreness of the tongue, often with no visible

glossitis, is a common complaint. In women there is apt to be a concurrent non-specific vaginitis, usually with hyperesthesia and dyspareunia." None of these signs and symptoms is specific.

Kruse (1942) described lesions of the tongue discernible with the biomicroscope, which he claimed to be diagnostic of the earliest stages of nicotinic acid deficiency. They showed some evidence of slow healing when heavy doses of nicotinic acid were given by mouth, but the process was often incomplete after 14 months of treatment.

A confusing literature on the excretion of nicotinic acid and its derivatives led the U.S. National Research Council (1949) to conclude that "findings should be interpreted with caution in evaluating niacin nutrition".

Other Aspects of Vitamin B Complex Deficiency

Very little is known about human dietary requirements, if any, of other components of the vitamin B complex, and still less about the possible clinical insignia of deficiency. The situation is made difficult, from the experimental point of view, by synthesis of these nutrients in the intestine. Conditioned deficiency of vitamin B₆ was produced in 34 of 50 subjects by administration of the antimetabolite deoxyypyridoxine (Vilter *et al.*, 1953). They found that "vitamin B₆ deficiency in human beings mimics the clinical manifestations of all vitamin B complex deficiency states", with seborrhoeic dermatitis, glossitis, cheilosis, conjunctivitis, peripheral neuritis, anorexia and lethargy. A diet in which 30 per cent. of the energy was derived from egg white was used to produce biotin deficiency in man (Sydenstricker *et al.*, 1942). Such experiments cannot be regarded as necessarily having a relation to any naturally occurring deficiency disease, and there is no evidence of such naturally occurring deficiencies of other components except possibly vitamin B₁₂. The relationship between vitamin B₁₂ and animal protein makes it possible that deficiency of vitamin B₁₂ does occur in and affect the course of kwashiorkor, tropical macrocytic anaemia and macrocytic anaemia of pregnancy.

Outside the laboratory, deficiencies are seldom or never simple and in field observations lack of the vitamin B complex may be confused by the simultaneous presence of infectious disease or disturbances of intestinal function. Such considerations may account for the remarkably varied clinical pictures produced among prisoners of war in Japanese internment camps, where, in addition to beriberi, pellagroid conditions, and riboflavin-deficiency states, unexpected conditions such as "burning feet" and retrobulbar neuritis were common. Deficiency states clinically resembling those attributed to members of the vitamin B

complex were frequently seen among troops in India, particularly on the Burma front. Among British troops, sprue-like syndromes were usual, while among Indian troops severe macrocytic anaemia and "marasmus", associated with diets containing little meat, were common. Marriott (1945), Girdwood (1948), Keele and Bound (1946) and Thomson (1946), have described the clinical manifestations, which arose without warning in the Indian troops who were not particularly anaemic beforehand but were exposed to heavy malarial attack. British troops, similarly infected, responded satisfactorily to conventional treatment, but the Indians frequently did not respond to malarial or anti-anaemic treatment. It seems clear that these were "conditioned" deficiency states rather than the results of simple deficiencies in the diets.

Horwitt *et al.* (1948) studied a group of five men aged between 20 and 40 and seven aged between 60 and 80 (mental patients) who for 3 years received a mixed diet supplying 2000 Cal. and about 400 µg. vitamin B₁ and 800 µg. riboflavin daily. A similar group received the same diet supplemented with yeast extract for 2 years, then a diet with about the same riboflavin content and a vitamin B₁ content of 200 µg. A control group received normal hospital diet. "No definite claim of changes could be made in the first year of the experiments." Later there were changes in the skin, which became thin and smooth with decreased turgor. Changes in the lips included dryness, erosions and detachment of the epithelium at the edge. There was some impairment of appetite, reduced blood pressure and slight oedema in the older subjects. Severe restriction of vitamin B complex brought about correspondingly severe physical and mental changes, including oedema and lowered blood pressure, loss of appetite with gastro-intestinal disturbances, and neuropathy and affections of the skin. The results suggested that the young were less resistant than the old.

It may be noted, in passing, that in almost all the experimental studies of vitamin B deficiency states great emphasis is laid on mental changes. This emphasis is much less clear-cut in field observations, except of pellagra. As was already noted, Thomson and Freedman's observations during an outbreak of riboflavin deficiency made the point that mental impairment became obvious only by the contrast between "cured" and untreated cases. Descriptions of mental disturbances are conspicuously uncommon among accounts of deficiency states in Japanese prisoner-of-war camps. It may be that the conditions of experiments in mental institutions tend to magnify effects on personality, especially when physical changes are of slow onset and relatively undramatic quality.

Vitamin C

The experiment of Crandon, Lund and Dill (1940) was the first in which voluntary deprivation was maintained until clinical signs appeared. The first symptom of deficiency was extreme fatigue after about 3 months. The earliest sign was follicular hyperkeratosis after 132 days, followed by the perifollicular haemorrhages characteristic of scurvy. No gross change in the gums was observed. There was unsatisfactory healing of an experimental wound. A more extensive trial of experimental vitamin C deficiency is that of the Medical Research Council (1953) undertaken on 20 subjects of whom 10 were completely deprived, three were given 70 mg., and seven were given 10 mg. vitamin C daily in addition to the experimental ascorbic-acid-free diet. The first sign of deficiency was follicular hyperkeratosis, appearing after from 21 to 26 weeks. A few weeks later, haemorrhagic changes in the hair follicles appeared and progressed. Gum changes appeared after at least 23 weeks of deprivation, beginning with reddening, swelling and tiny haemorrhages in the tips of the interdental papillae. After 9 months, nine out of the ten subjects showed gum changes, which in 2 were gross, the gums being purplish, much swollen and spongy. Experimental wounds were made in 6 of the 10 subjects after from 4 to 8 months' deprivation. The wounds healed normally, but later there were haemorrhages into the scar tissue. New wounds made at the stage of pronounced scurvy failed to heal at the normal rate. "Special incidents" caused emergency curtailment of the experiment in some cases. One volunteer developed knee-joint effusions, and 2 others signs of cardiac failure. There was no psychiatric disturbance. Agility tests indicated increased fatigue, but exercise tolerance tests failed to show any significant difference of pulse-rate response among the 3 main groups of volunteers. Tests of capillary strength, both positive and negative, failed to reveal any change. There were no significant haematological changes. Pains in the back, joints and limbs were reported with increasing frequency as the signs of scurvy developed.

This picture is clearly similar to, if not as horrifying as, that of scurvy experienced by the old seafarers. In "The Voyages of Jacques Cartier" during the 16th century (Biggar, 1924) we read: "The sickness broke out among us accompanied by most marvellous and extraordinary symptoms; for some lost all their strength, their legs became swollen and inflamed, while the sinewes contracted and turned as black as coal. In other cases the legs were found blotched with purple-coloured blood. Then the disease would mount to the hips, thighs, shoulders, arms and

neck. And all their mouths so tainted, that the gums rotted away down to the roots of the teeth, which nearly all fell out."

Neither the experimental nor the field observations offer any means of diagnosing incipient scurvy. The earliest signs are non-specific. Parry (1821) says "... and one day in the week was appointed for the examination of the men's shins and gums by the medical gentlemen, in order that any slight appearance of the scurvy might at once be detected, and checked by timely and adequate means". It is doubtful if modern "medical gentlemen", relying on clinical observation alone, could do anything more.

As regards laboratory methods, Crandon found that his plasma ascorbic acid fell to zero within 2 months (two months before the appearance of the first clinical sign), and ascorbic acid in the white cells of the blood fell to zero after 122 days, *i.e.*, about 2 weeks before the appearance of perifollicular haemorrhages (Crandon, Lund and Dill, 1940). In the Medical Research Council experiment, the plasma level was 0.55 mg. per 100 ml. during a preliminary period when 70 mg. ascorbic acid were being given, and fell to 0.03 mg. after 37 days of deficiency. The position was similar among the volunteers receiving 10 mg. daily. Levels in the white blood cells fell from 15.6 mg. per 100 g. during the preliminary period to 1 mg. in 113 days, and remained below that value for the remainder of the experiment. Among the volunteers receiving 10 mg. vitamin C the white cell level fell to between 1.5 and 3 mg. per 100 g. in 86 days and remained at about 1 mg. from about the 109th day onwards. "About 100 days elapsed between the virtual disappearance of vitamin C from the plasma and the appearance of the first clinical signs of scurvy. On the other hand, the concentration of vitamin C in the white cells reached its lowest value only 3 to 6 weeks before clinical scurvy appeared." It is of interest that the plasma and white cell levels could scarcely distinguish between volunteers almost totally deprived and those receiving 10 mg. ascorbic acid daily. "It is doubtful whether a single blood determination could differentiate the concentration of vitamin C in plasma, whole blood or white cells of persons on a prolonged intake of about 1 mg., which in nine cases out of ten produced scorbutic haemorrhages after 6 to 8 months, from that of persons on an intake of about 11 mg., which over a period of 14 months prevented the appearance of the clinical signs of scurvy. . . . For assessing the state of vitamin C nutrition it appears that, in a fasting person, a plasma value below 0.10 mg. per 100 ml. indicates an average daily intake of 20 mg. or less. If, therefore, in a doubtful case of scurvy the plasma level is 0.10 mg. per 100 ml. or more, the existence of scurvy is

very improbable, since the intake of 20 mg. daily, necessary to maintain a plasma level of 0.10 mg. per 100 ml., was found to be an adequate curative dose. On the other hand, a plasma level of below 0.10 mg. per 100 ml., though an accompaniment of scurvy, is not proof of scurvy or of imminent scurvy. . . . The determination of vitamin C in the white cells is of somewhat greater diagnostic value, because it shows more definite differences between the daily intakes of 20 mg., 10 mg., and less than 5 mg. A concentration below 2 mg. per 100 g., especially when confirmed on repeated analyses, indicates severe depletion and supports the diagnosis of scurvy. Eventually, with some further improvement in the technique, it may be possible to assess the dietary intake from the result of vitamin C estimations on the white cells." On the basis of these experiments, there is no evidence of any impairment of health at levels of vitamin C intake not producing scurvy and, indeed, there is no satisfactory evidence of "latent malnutrition" in respect of vitamin C elsewhere in the literature.

THE DIAGNOSIS OF MALNUTRITION

Naturally occurring "malnutrition" is seldom, if ever, the result of a single deficiency and may be regarded as the sum of several specific and separate deficiency states or as a general reaction to a multiplicity of causes. As the preceding section of this review has shown, it is in practice impossible to recognise any specific deficiency before the appearance of characteristic signs; such early reactions as appear are non-specific. For these reasons, a general concept of non-specific "malnutrition" is valid and useful, and may be defined as those defects of growth, function and structure which are produced by deficient diets of many kinds and which may be accompanied by some degree of underfeeding. In practice, insufficiency and deficiency tend to occur together.

The Clinical Picture

The observant physician knows that he can, in general, distinguish between the appearance of good health and poor health although, if he is critical, he knows also that his judgment is subject to a high degree of "observer error", probably dependent in large measure on the standard of health among the population to which he is accustomed. Thomson (1945) attempted to delineate the characteristics of good and poor health, from the nutritional point of view, among soldiers:

"The well-nourished soldier . . . has been well-nourished and active from infancy, and generally comes of well-nourished stock. He has suffered no disease which has left any permanent dis-

ability. In stature and build he is usually (though not necessarily) above the average of his race. . . . There are no postural defects and no skeletal disproportion or asymmetry. The spinal furrow is not completely flattened at any point, and when the arms are raised above the head there is no 'winging' of the scapulae. When he touches his toes, the vertebral column forms a smooth curve without definite flattening at any point. His skin has the 'bloom' of vigorous health, and is smooth, soft, elastic and slightly moist to the touch. There is a moderate amount of subcutaneous tissue over firm and well-developed muscles. He has no pot-belly, and no palpable spleen or liver. His eyes show a clear cornea surrounded by a white smooth sclerotic with little visible vascularisation, and during inspection there is no undue photophobia or watering. His vision, by night or by day, is excellent. The teeth are regular, and, in the absence of infective gingivitis, are set in firm and healthy gums. The tongue is neither too large nor too small, with no more than a slight fur, and there is no discolouration, fissuring, stripping of the epithelium or enlargement or flattening of the papillae. The mucous membranes are well-coloured and healthy. Blood examination would show normal haemoglobin content and red cells of normal appearance and size. The appetite is good and bowel function regular. The fit and well-nourished soldier gives an impression of alertness and vitality which is the opposite of apathy and listlessness. . . . When trained hard, he shows outstanding endurance, both physical and mental, and can go short of food, when necessary, without showing ill-effects for a considerable time. . . ."

"The malnourished soldier . . . At an early stage, the symptoms are generally non-specific—impairment of endurance, vitality and resistance to disease, slow recovery from disease or even impaired morale. The diagnosis is then one of considerable difficulty and can be made with assurance only after full investigation of the previous history and dietary, and full consideration of the differential diagnosis. At a later stage depletion of the nutritional reserves reaches a stage when more or less specific signs and symptoms appear. Again, the picture is not necessarily clear cut; if calorie intake has been so low as to cause inanition, specific deficiency lesions may be masked, or residual signs from malnutrition in the past may persist and confuse the issue. The presence of infectious disease may also modify the picture. The onset of malnutrition is generally very insidious; the lack of dramatic manifestations may lower standards of judgement so that an impaired level of health is taken as 'normal'. In the final stage, the picture becomes that of severe inanition or one of the classical deficiency

diseases. . . . All clinical impressions should be confirmed by finding out whether the diet has been such as to cause the type of malnutrition suspected, and all causes of secondary [conditioned] malnutrition should be looked for."

The belief that differences of nutritional status may be apparent to the discerning eye, even in the absence of objectively measurable criteria, is insistent and certainly correct. Thomson, Verma and Dilwali (1946) noted that in a feeding experiment among Indian Army recruits "A nutritious diet . . . caused a gain in weight amounting to about 5 to 10 per cent. of their initial weight within 3 to 4 months. There was also a marked clinical improvement, which, however, was not accurately reflected in a record of the incidence of certain specific signs attributed to chronic malnutrition", that is to say, signs which were then attributed to specific deficiencies. In the latter half of the war, the average Indian infantryman at enlistment was a smallish, thin individual with spindly limbs, a rough dry skin and often many signs of what appeared to be specific nutritional deficiencies, including mild hypochromic anaemia. "This picture became so uniform that it was something of a shock to come across a group of soldiers conforming to the highest standard that India can produce. On rare occasions one would meet a group of men about 6 feet tall, towering above other troops with them, and manifestly of excellent physique. It was difficult to believe that these were also Indians" (Thomson, 1946). The recovery of starved children during the Bengal famine of 1943 afforded another illustration. Refeeding with a diet based on milk not only restored these children but produced an appearance of liveliness and blooming health such as was seldom seen in the ordinary children of an Indian village (Thomson *et al.*, 1946). Such contrasts are dramatic, and were easily apprehended just because they existed together. How much more difficult is judgment in a more uniform population where the extremes differ by much less and are seldom seen together.

The technique of passing a general clinical judgment on nutritional status, after a clinical examination, has been widely used by the school medical service in Britain. The so-called "Dunfermline Scale" is used, in which children are placed in one of four groups ranging from "excellent" to "bad", and the findings are reported year by year in the reports of the Chief Medical Officer of the Board (now Ministry) of Education. In 1947 the description of these grades was changed from "nutritional state" to "general condition". Jones (1938) first cast doubt upon the worth of this method by showing that there was substantial disagreement between experienced physicians classifying and re-classify-

ing the same children and that a simple mathematical expression of body size, Tuxford's index (see below), was more successful in picking out "malnourished" children than the judgment of two or more experienced physicians. Almost simultaneously Derryberry (1938) drew similar conclusions from an analysis of the data of a survey made in 1929. Later Bransby and Hammond (1950) made a similar report.

Somatometric Measurements

Most of the earlier somatometric indices of nutritional status were expressions of height in relation to weight, sometimes involving powers of height or weight, which did not take age into account. Later, measurements of breadth and girth, *e.g.*, girth of chest and arm, width of pelvis, were added, or even used alone. Such measures are more likely to reflect the somatotype (body build) than the modifications of growth and form which may be produced by the environment. Tuxford (1917) devised an index derived from the height, weight and age relationships shown by London schoolchildren and yielding a mean value of 1.00 at all ages. Jones (1938) found Tuxford's index a more effective measure of poor nutrition than any individual clinical judgment. Tuxford (1942) revised his index to fit the measurements given by London schoolchildren in 1938. Campbell and Weir (1948) used the 1938 index to trace secular changes in growth among schoolchildren since 1905. They found that when it was applied to the English boys on whose measurements the original index had been based its value was 0.980 at age 3½ and fell steadily to 0.872 at 14½ years. For girls the corresponding values were 0.998 and 0.853. London schoolchildren in 1938 were not only taller at all ages but on the average also about 7.5 per cent. heavier for their increased heights than children in the period 1905-12, and "this indicates a substantial improvement in nutrition, greater at higher than at lower ages". Data for Glasgow schoolchildren between 1910 and 1945 were then compared. The index value rose during the period, but even in 1945 did not reach the 1938 London values. Campbell and Weir say "the fact that the index for the 13 year old children is now almost as high as at 5 years old, *i.e.*, that the previous deterioration with age has almost disappeared, taken in conjunction with the time sequence of the changes, suggests that the improvement is related to the provision of first milk, and then milk and meals, in schools". They say that with a continuously improving school population, the index may require frequent revision in order to effect correct grading, but "there can be no doubt that the index can be most useful now to follow secular

trends; to compare the status of different groups; to select the genuinely undernourished from groups of children and to assess the response to treatment".

It can be taken as proved that weight for height in relation to age is a useful tool for assessing the nutritional status of groups of children. This is confirmed by the Carnegie Survey data, which also demonstrate the response to improved feeding.

A currently popular device for using age/height/weight relationships is Wetzel's "grid" and its variants, in which growth along a given channel is considered to indicate satisfactory nutrition, while migration of the growth curve to lower channels indicates impairment. The origin of the norms used is not indicated. Wetzel (1941) claimed that the grid distinguished 94.5 per cent. of children judged to be in poor or borderline health by physicians and (1943) that the trends shown could reveal oncoming malnutrition 2 to 5 years before the clinical picture became sufficiently manifest to call for treatment. On the other hand, Leeson, McHenry and Mosley (1947) found that the opinion of an examining physician agreed with the "grid" evaluation in only half their cases, and thought that the somatometric data should be used in conjunction with an adequate physical examination. Wetzel's grid was, of course, designed to assess the nutritional status of the individual child and is probably no better and no worse than any other similarly based somatometric index. Like others, it will screen in accordance with the material from which it is derived; in addition, deviation downwards of a line may mean not deterioration but improvement of health, with a sudden spurt of linear growth with which weight gain has not kept pace (Lamberts, 1952).

Procedures for Surveys

In the search for uniformity of procedure in surveys, elaborate schedules for somatometric and clinical examination have been drawn up, e.g., by the U.S. National Research Council (1949), which says "Standardization of survey methods has worked well for the physical scientists and especially for the astronomers. . . . Therefore, in order to provide comparable data in the field of nutrition which can be read critically by any competent surveyor, a plea is made for standardization." While such sentiments and procedures are admirable in principle, they do not resolve the basic difficulties. Bean (1948) found significant differences between the observations of a group of physicians *trained in clinical nutrition and using a set of objective standards* when examining soldiers for signs of deficiency. "Data on the incidence of deficiency diseases, degree of severity and response to therapy acquire the aura of accuracy

when tabulated and dealt with mathematically. . . . No conclusions can be more valid than the data upon which they are based. Not only is the interpretation of sign and symptom a matter for dispute but the data just presented demonstrate that physicians trained in the clinical discipline of nutrition vary significantly in what they actually see in examining a person." This is certainly true of incipient deficiency states, where the clinical signs are "nondescript and variable".

If the biological astronomer has difficulty in maintaining a uniform standard of observation, his material also is troublesome. The stars remain in their courses, but human beings are constantly in a state of biochemical flux skilfully designed to give the appearance of stability. If one pathway of metabolism is blocked by lack of some enzyme or building-stone there are wide powers of adjustment to reach approximately the same end by alternative pathways.

Many ingenious methods have been evolved to obtain permanent records of physical characteristics, or in the hope of increasing the objectivity of clinical data. For example, Squires (1953a) described a method of making permanent records of tongue patterns. He (1953b) has also investigated the relationship of fluorescence of the tongue to nutritional status. Measurements of body fat, by skin folds or radiographic means, have received considerable attention in recent years. Regarded as research procedures in the evaluation of changes in body composition resulting from under- or over-feeding, such measurements have considerable interest (Brožek and Keys, 1950), but there are signs that skin fold measurements may be used uncritically and almost certainly without justification as a routine procedure in the general evaluation of "nutritional status".

The idea that functional impairment precedes the appearance of structural changes led to the study of tests of physical fitness, e.g., the Harvard step test, but the relevance of the results to nutritional status is doubtful. Indeed, the U.S. National Research Council (1949) goes so far as to say that it does not recommend the use of any "fitness tests" in general surveys.

X-ray photographs of the developing skeleton have been used to assess skeletal maturity in relation to nutritional status (Schmidt, 1941; Abbott *et al.*, 1950). Atlases of ossification pattern in well developed children have been prepared as standards against which to compare the skeletal maturity of children under investigation. These are, without doubt, an important contribution to knowledge of the physiology of growth and they would certainly help in the diagnosis of metabolic errors of bone growth, but there is no evidence to show that they add anything to the diagnosis of malnutrition that the

cruder study of body measurements will not provide.

The search for indices of nutritional status has led to the use of biochemical measures in bewildering profusion. Some of these have been discussed in the section dealing with specific criteria, where their generally unhelpful nature is apparent. While admitting the difficulties, the U.S. National Research Council (1949) thinks that, in future, biochemical examination will undoubtedly be an integral part of all nutrition surveys. And so the search continues. It has not failed to throw up non-specific criteria, *e.g.*, the level of cholinesterase in the blood plasma. The function of this enzyme appears to be unknown, but its activity in plasma has been found to fall in fairly severe underfeeding and to rise with increased food consumption (Hutchinson, McCance and Widdowson, 1951). Whether its estimation is of any value in detecting minor degrees of underfeeding is doubtful, and there is certainly no reason to think that it will be useful in the detection of incipient or mild malnutrition (Saunders *et al.*, 1952).

THE OUTLOOK

The first lesson to be drawn from the evidence discussed is that specific criteria of malnutrition short of frank deficiency disease have not been discovered. This does not mean that most of the groups studied have been adequately fed, *i.e.*, that they were not malnourished. As Thomson, Verma and Dilwali (1946) found, the use of specific clinical signs of malnutrition was of little value even in assessing the progress towards health of a group of undoubtedly malnourished Indian recruits, and the non-specific signs could not be reduced to objectively measurable entities. Again, malnutrition was undoubtedly common among children from the poorer strata of British society before the war, but carefully recorded lists of signs and symptoms failed miserably, for the most part, to distinguish between the ill fed and the well fed, and there was no change, except in growth, attributable to improved feeding over about a year (Carnegie Survey). Again, carefully controlled experiments in human malnutrition have failed to produce criteria whereby the prodromal stages can be recognised with any certainty.

It may well be that the concept of "biochemical lesions" leading to impairment of health short of deficiency disease has been thoroughly misleading. Many of the vitamins fulfil the roles of enzymes or take part in enzyme reactions, or are otherwise intimately concerned with energy conversion or metabolism of structural materials. Enough may be sufficient; there may be little or no "twilight zone", in terms of health, between, say, saturation and manifest deficiency. It is, of course,

possible that this may not be so in the growing child, and that the stages of deficiency before signs appear might be characterised by slowing of growth. But in ordinary life, deficiency of vitamins will almost never occur without simultaneous deficiency of structural material, particularly of calcium and protein, and it will be impossible to remedy deficiency of protein or calcium with any natural food without adding at least the B vitamins.

The most clear-cut biochemical data show that malnutrition can occur without obviously abnormal nutrient levels in blood or tissues, or that the nutrients fall to extremely low levels before clinical impairment is manifest. What we are looking for is not biochemical indications of impending catastrophe but the characterisation of a hypothetical twilight zone between optimum health and deficiency disease. What has been done so far is to demonstrate a relationship between diet and some biochemical levels, but these furnish, at present, little more than a partial and unsatisfactory alternative to diet surveys.

Other nutrients, *e.g.*, calcium, fulfil a structural role. Here there may be a much wider zone between abundance and structural failure. Scarcity of supply is met with economy of utilisation and the main manifestations of malnutrition will be in relation to growth and form, not to function and detailed structure. In children, even when they have been fully safeguarded against rickets and other possible deficiency disease, malnutrition may still result from slight underfeeding with relative shortage of some structural material. On this basis, it is reasonable to expect that growth will be restricted to the rate permitted by the material in shortest supply, most probably calcium or protein.

The second lesson to be drawn from the evidence is that since the organism must be healthy to grow satisfactorily, growth is a good measure of general health, and since growth is the product of nutrition it measures nutritional status. It is true that acute infections slow or arrest growth, but in the well fed child such delays are rapidly and fully overtaken. Vital statistics and studies of the social distribution of growth rates and attained statures all show that superior growth rates and heights correlate well with superior health. For example, the publications of Baird and his team (Baird, 1945; 1949; 1952b) show that tall women experience lower rates of stillbirth, prematurity (birthweight 5.5 lb. or less) and dystocia; while human growth studies such as those of Campbell and Weir (1948) show that improving nutritional conditions among schoolchildren are paralleled by improved rates of growth.

The assessment of growth in relation to nutrition is complicated by innate differences of body type and growth potential, but many of these difficulties

can be avoided by using the fact that the evolution of adult body shape involves an orderly sequence of changes in body proportions (Leitch, 1951; Hammond, 1953). The ratio of cristal height to total height changes from about 0.33 at birth to 0.66, the maximum so far recorded in well built adults. In brief, the pattern of normal growth from foetal life into adulthood implies relatively greater growth in leg than in trunk length. Under conditions of poor nutrition with slowed rate of growth, the ratio of leg length to total height remains relatively immature, i.e., numerically low. This suggests that individual children or groups of children of a given age with relatively short legs will be poorly nourished and in poor states of health. The hypothesis was tested directly on the data of the Carnegie U.K. Dietary and Clinical Survey, and has been found to hold good. The ratio of leg length (cristal height) to total height was found to differentiate more sensitively than total height between children in different food expenditure and age groups. The suggestion is therefore made that leg length in relation to total height and age will be one of the most satisfactory indices of nutritional status in children. If it is true that ill-grown children become adults with some of the somatometric characteristics of immaturity, it will be useful also among adults.

The index has the merit of being relatively insensitive to short-term changes in nutrition, which may cause rapid changes in bodyweight and hence affect indices based on height, bodyweight and age. Such indices may, of course, be of special value when the intention is to assess suspected changes of nutritional status within a population, e.g., in war time. Considerable care in their interpretation is necessary since, while it is probably impossible to become too tall as a result of overfeeding, it is certainly possible to become too fat. Adult bodyweight is particularly suspect in this connection, overweight being definitely correlated with high mortality (Breslow, 1952), so that a falling bodyweight among the adult population may imply improving health and not, as suggested by Harries and Hollingsworth (1953), the reverse.

To sum up, future studies of growth in relation to nutrition should be more clearly related to primary patterns of development than are some of the esoteric somatometric indices devised in the past to fit arbitrarily selected data. The use of an inherent pattern provides an internal standard.

Arising from this there is a most important question. Does the slowing of growth and its arrest while the form of the body is still relatively immature mean parallel impairment of the *elan vital*? Does it imply that the stunted adult lacks vitality?

How does one define and measure vitality? This is a matter of no small difficulty in respect of

individuals, but for populations the use of vital statistics merits consideration. If there is any exception to the rule that well fed populations have a favourable mortality experience, and vice versa, we are not aware of it. The correlation is, however, a crude one which can be interpreted in terms of nutritional causation only with great difficulty. The use of antibiotics to control infectious diseases by elimination of organisms in the environment and in the body, as is at present happening in the Middle and Far East, means that abrupt changes in mortality experience can occur without any concurrent change in host resistance. People so freed from the burden of infectious disease will as a consequence improve food production and their standard of living, so that the deficiency diseases will be reduced or disappear; their vital statistics will only then approach those of Western Europe and North America. In a community with little infection and a high standard of living, mortality rates in general are low although a host of "degenerative diseases", affecting mainly the middle and later years of life, keep the doctors busy. They are, probably, due in part to overfeeding, and control of energy intake would almost certainly produce a further fall of mortality. There is some evidence of this in the reduction of death rates from hypertensive and cardiovascular diseases that occurred in Western Europe during the war years. For a review see Strøm and Rygh (1952).

Ideally, the best mortality statistic to use as an index of malnutrition would be one which depended little on either infectious or senile degenerative processes, but which was influenced by the physiological efficiency of the organism at its prime. No ideal mortality rate exists, but the neonatal death rate or, even better, the first-week death rate is probably one of the best, because a substantial proportion of deaths in the earliest period of life are due to prematurity with no obvious pathological cause (Joint Committee of Royal College of Obstetricians and Gynaecologists and British Paediatric Association, 1949; Baird, 1953). Duncan, Baird and Thomson (1952) and Baird, Thomson and Duncan (1953) have discussed the behaviour of the first-week death rate and of the stillbirth rate, and suggest that trends in this country during the war years are difficult to explain except on the hypothesis of improved maternal nutrition.

It is unfortunate that clinical observation has so seldom been linked to measurements of diet. Both, undertaken together, are essential if the relations of health to diet are to be understood. Logic has sometimes been forgotten in differentiating between dietary standards set up as minima for health and those set up as optima. It is too easily assumed that because standards for any

nutrient can be placed on one quantitative continuum there is a similar continuum in respect of health: "the more food, the better for health". This is certainly not universally true. Because it is so difficult to define and measure the consequences for health of sub-optimum but not disease-producing diets, nutrient standards in common use are derived not from any intimate relation of the several nutrients to health, but from records of the ordinary diets eaten by healthy people. As social targets they are obviously valid and desirable, but, if a given population fails to reach the appropriate target, this is not to say that it must be suffering from any clinically demonstrable defect of health, though in the long run defects of growth, or poor morbidity and mortality statistics, might differentiate it.

It might be thought that the failure of "minor"

signs, symptoms and biochemical phenomena to provide us with practical measures of malnutrition in a relatively well-nourished community, such as that of present-day Britain, leaves us barren of resources. This is not so. Within the past 15 years there has been a remarkable acceleration in the growth of children, accompanied by imponderable but obvious improvements in health and by reductions of mortality, which no one in 1938 could have predicted. To attribute these, at least in part, to the concurrent improvement of national nutrition is not unreasonable. Many defects remain and even deficiency disease is not yet unknown. We have the salutary warning of Brailsford (1953) that the subperiosteal haemorrhage of scurvy in infants has recently been mistaken for sarcoma.

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1. TECHNIQUE

CHEMICAL

APPARATUS

1

PRITZKER, J. and JUNGKUNZ, R. Über einen Perforationsapparat für Extraktionen mit spez. leichten oder spez. schweren Lösungsmitteln. [Apparatus for extractions with specially light or specially heavy solvents.] *Mitt. Geb. Lebensmittel. Hyg.*, 1953, **44**, 229-232. [Basle.] French and English summaries.

2

MITCHELL, P. A micro lipid extractor. *Nature*, 1953, **172**, 124. [Dept. Biochem., Tennis Court Rd., Cambridge.]

3

NIEMAN, C., ROOSELAAR, W. J. and DE HAAN, H. Distillation apparatus for the determination of iodine in biological material. *Chemist Analyst*, 1953, **42**, 42. [Netherlands Inst. Nutrit., Amsterdam.]

A modification of Chaney's digestion and distillation apparatus (Abst. 52, Vol. 10) is described and illustrated.—B. W. Simpson.

4

HOLDEN, H. F. A sensitive photo-electric colorimeter. *Austral. J. Exp. Biol. Med. Sci.*, 1953, **31**, 173-174. [Walter and Eliza Hall Inst. Med. Res., Melbourne.]

The instrument is described in detail: only 2 ml. of solution are required although the optical path is through 7.7 cm. of liquid.—H. G. Bray.

5

MOORE, A. M. and BOYLEN, J. B. A simple method for making transfers in paper chromatography. *Science*, 1953, **118**, 19-20. [Div. Biol., Atomic Energy Canada, Ltd., Chalk River, Ont.]

The eluate drips from the tip of the first chromatogram directly on to the second, which is held horizontally, its dispersal being controlled by an air stream directed at the underside of the second chromatogram. An apparatus and the technical details of the procedure are described.

H. G. Bray.

6

KRAVCHENKO, N. A., SAMARINA, O. P. and KRITSMAN, M. G. Modifikatsiya metoda elektroforeticheskogo razdeleniya belkov na fil't-

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roval'noi bumage. [Modification of the method of electrophoretic separation of proteins on filter paper.] *Biokhimiya*, 1953, **18**, 34-36. [Inst. Biol. Khim., Akad. Med. Nauk. SSSR, Moscow.]

A simple apparatus is described with which blood serum proteins were separated satisfactorily by electrophoresis. It consists of a glass tank $40 \times 60 \times 20$ cm. covered with a glass plate. The filter papers which are fed with buffer solution and on which the proteins are separated are freely suspended in the tank on glass rods fixed to the sides of the tank, the free ends of the filter papers being immersed in the electrode vessels. The air in the tank is saturated with water vapour from a layer of water on the floor of the tank; the electrode vessels are three 700- to 800-ml. beakers. Two filter papers can be used simultaneously. The middle beaker contains the cathode and the two others contain anodes. The electrodes themselves are specially constructed so that the needle electrodes employed are not in direct contact with the buffer solution contained in the beakers and the pH changes which occur near the needle electrodes are not easily transmitted to the papers. For the separation of blood serum proteins, veronal of pH 8.6 and ionic strength 0.1 was the buffer. After electrophoresis for 20 to 24 hr. the papers were dried and treated with 1 per cent. bromophenol blue in 59 per cent. ethanol saturated with $HgCl_2$.—W. Hughes.

7

CUENDET, L. S., MONTGOMERY, R. and SMITH, F. Cellulose sheets as chromatographic supports. *J. Amer. Chem. Soc.*, 1953, **75**, 2764-2765. [Dept. Agric. Biochem., Univ. Minnesota, St. Paul.]

Cellulose sheets, $\frac{1}{8}$ in. thick, have high loading capacities but owing to their poor wet strength can be used only in horizontal development chromatography. An apparatus is described.

H. G. Bray.

ANALYTICAL METHODS

General

8

SCHLÖGL, K. and SIEGEL, A. Eine einfache Methode zur weiteren Auftrennung papierchromatographisch vorgetrennter Substanzgemische. [A simple method for the further separation of mixtures of substances previously

separated by paper chromatography.] *Hoppe-Seyler's Ztschr.*, 1953, **292**, 263-268. [2. Chem. Lab., Univ. Vienna.]

In the method described for the further separation of substances already separated by paper chromatography, the "spots" requiring further investigation are cut out from the first chromatogram, and fixed between glass strips at the start of another chromatogram. If desired, changes of paper or solutions may be made in the new chromatogram to give more exact identification. Several examples are described illustrating the possibilities of the method.—M. B. Richards.

9

ZAHN, R. K. and STAHL, I. Die kontinuierliche Extraktion von Stoffgemischen unter Änderung eines Parameters nach dem Volum-Ersatzprinzip. [Continuous extraction of mixtures of substances with alteration of a parameter according to the volume replacement principle.] *Hoppe-Seyler's Ztschr.*, 1953, **293**, 1-10. [Inst. Chem. Physiol., Johann-Wolfgang-Goethe-Univ., Frankfurt a.M.]

In this method of continuous extraction a precipitate of the protein mixture to be separated is thrown down on a suitable carrier substance in a column through which filters a solution of ammonium sulphate. By means of the apparatus illustrated the solution undergoes continuous dilution on the volume replacement principle, so that the components of the precipitate are successively extracted according to their solubility, and are collected in different fractions. The method can be varied for the extraction of other substances, and the mathematical treatment of the parameter changes is described.—M. B. Richards.

Carbohydrate Constituents

10

GAILLARD, B. D. E. Use of unneutralized hydrolysates in paper chromatography of sugars. *Nature*, 1953, **171**, 1160. [Lab. Animal Physiol., Agric. Univ. Coll., Wageningen.]

If an acid spray such as aniline phosphate or phthalate is used, polysaccharide hydrolysates prepared with H_2SO_4 need not be neutralised before qualitative or quantitative chromatography.

H. G. Bray.

11

GIRI, K. V. and NIGAM, V. N. Separation of simple saccharides and oligosaccharides by circular paper chromatography. *Naturwissenschaften*, 1953, **40**, 343-344. [Dept. Biochem., Indian Inst. Sci., Bangalore 3.]

The circular filter paper technique previously described for separating amino-acids can be used for the separation of saccharides and oligosaccharides, with *n*-butanol-acetone-water (20 : 70 : 10) as

solvent mixture and aniline-diphenylamine phosphate as detecting reagent.—H. G. Bray.

12

TAKATA, M., TAKAHASHI, Y. and SASAKI, K. Eine neue Mikromethode zur Bestimmung des Blutzuckers (Perjodat - Methode). [A new micromethod for estimating blood sugar (periodate method).] *Klin. Wochenschr.*, 1953, **31**, 590-593. [Med. Chem. Inst., Toho Univ., Tokyo.]

13

PROKHOVNIK, S. J. and NELSON, J. F. Determination of blood sugar with anthrone. *Austral. J. Exp. Biol. Med. Sci.*, 1953, **31**, 279-282. [Dept. Physiol., Univ. Melbourne.]

The method is applicable to amounts of glucose of from 6 to 100 μg . and is most precise for 40 to 60 μg . A zinc hydroxide blood filtrate is prepared and treated with a solution of anthrone in concentrated H_2SO_4 and heated in a boiling-water bath and the colour produced is estimated.

H. G. Bray.

14

LUNT, E. and SUTCLIFFE, D. A new calorimetric reagent for carbohydrates. *Biochem. J.*, 1953, **55**, 122-126. [Dept. Exp. Pathol., Univ. Birmingham.]

The reagent is resorcinol-4 : 6-disulphonic acid ; its use is similar to that of anthrone, but it has the advantage of being more stable. The method is applicable to 10 to 250 μg . glucose in 5 ml. solution and is accurate to within 1 per cent.—H. G. Bray.

15

BERTRAND, D. Remarques à propos du microdosage des sucres réducteurs. [Remarks on the micro-estimation of reducing sugars.] *Bull. Soc. Chim. biol.*, 1953, **35**, 865-867.

It is shown that the original Bertrand method (*Bull. Soc. Chem.*, 1906, [iii], **35**, 1285) can be adapted for the micro-estimation of sugars provided the use of a large excess of alkaline copper solution is avoided and the excess Cu remaining after reduction is estimated with a photo-electric colorimeter. As little as 0.25 to 1.5 mg. of glucose can be estimated with an error not exceeding 0.025 mg.—W. Godden.

16

BOREL, E. and DEUEL, H. Quantitative Zuckerbestimmung mit 3, 4-Dinitrobenzoesäure. [Quantitative estimation of sugars with 3 : 4-dinitrobenzoic acid.] *Helv. chim. Acta*, 1953, **36**, 801-807. [Inst. Agric. Chem., Tech. Hochsch., Zürich.]

The reduction product, under alkaline conditions, of 3 : 4-dinitrobenzoic acid and sugars was

N.A. and R., January 1954

shown to be 3-nitro-4-hydroxylaminobenzoic acid. A procedure is described for the estimation of from 0.05 to 0.5 mg. of sugars, the absorption being measured at 548 m μ . The method is applicable to components of polysaccharide hydrolysates separated by paper chromatography.

H. G. Bray.

17

JONES, J. K. N. and PRIDHAM, J. B. **A colorimetric estimation of sugars using benzidine.** *Nature*, 1953, **172**, 161. [Dept. Biol. Chem., Univ. Bristol.]

The sugar solution is treated in a boiling-water bath with a 0.2 per cent. solution of benzidine in glacial acetic acid and the orange-yellow colour is estimated photometrically. The method is applicable to 0.1 mg. per ml. concentrations of most common sugars and their methylated derivatives, but not to ketoses, with an accuracy within 3 per cent.—H. G. Bray.

18

FONG, J., SCHAFER, F. L. and KIRK, P. L. **The ultramicrodetermination of glycogen in liver. A comparison of the anthrone and reducing-sugar methods.** *Arch. Biochem. Biophys.*, 1953, **45**, 319–326. [Div. Biochem., Univ. California, Berkeley.]

19

PECKHAM, G. T. and ENGEL, C. E. **The sugar content of hydrol (corn feeding molasses).** *J. Assoc. Off. Agric. Chem.*, 1953, **36**, 457–465. [Clinton Foods, Inc., Clinton, Iowa.]

The sample is hydrolysed with acid to convert oligosaccharides to glucose, which is estimated by treating with a copper reagent, separating the cuprous oxide formed, dissolving it in ferric sulphate solution and titrating the ferrous sulphate produced, using a phenanthroline indicator. Corrections are made for gains and losses during hydrolysis.—H. G. Bray.

20

WHISTLER, R. L., HOUGH, L. and HYLIN, J. W. **Determination of D-glucose in corn sirups by use of glucose dehydrogenase.** *Anal. Chem.*, 1953, **25**, 1215–1216. [Dept. Biochem., Purdue Univ., Lafayette, Ind.]

21

HERS, H. G., BEAUFAYS, H. and DE DUVE, C. **L'analyse simultanée des hexoses, des trioses et de leurs esters phosphorés. [Simultaneous estimation of hexoses, trioses and their phosphoric esters.]** *Biochim. biophys. Acta*, 1953, **11**, 416–426. [Lab. Chim. Physiol., Univ. Louvain.] English and German summaries.

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22

HADORN, H. and BIEFER, K. W. **Über polarimetrische und titrimetrische Stärkebestimmungen in Lebensmitteln. [Polarimetric and titrimetric estimation of starch in foods.]** *Mitt. Geb. Lebensmittel. Hyg.*, 1953, **44**, 276–292. [Lab. VSK, Basle.] French and English summaries.

Methods of estimating starch are reviewed. The method recommended for general use is a modification of that of Baumann and Grossfeld (*Ztschr. Untersuch. Lebensmittel*, 1917, **33**, 97). The method of Mannich and Lenz (*Ztschr. Untersuch. Lebensmittel*, 1920, **40**, 1) is suitable for flour, but not for materials containing soluble starch.

H. G. Bray.

23

SCHARPENSEEL, H. W. **Vergleichende Untersuchungen zur Rohfaserbestimmung und Ermittlung des Produktionswertes von Rauh-futtermitteln. [Comparative study of methods of estimating crude fibre and assessing the production value of roughages.]** *Arch. Tierernährung*, 1952, **3**, 137–144. [Inst. Tierzucht, Univ. Bonn.]

Crude fibre was estimated in 21 different types of feedingstuffs by Lepper's modification of the Weende method (Abst. 3833, Vol. 3), by the method of Puranen and Tomula (*Ztschr. Untersuch. Lebensmittel*, 1936, **72**, 111) and by that of Leitenberger and Opl (*Die Bodenkultur*, 1944, **3**, part 4). The third method gave good agreement with the first taken as standard and, on account of the small amount of manipulation required, is well suited to long series of analyses. The second method often gave results differing widely from those of the other two.

It is argued that, for coarse fodders, the correction of starch value by deduction of 0.58 times the percentage of crude fibre is not adequate and that a deduction should be made for lignin content. The author finds by calculation that this deduction may be from 0.95 to 2.55 units of starch value for each 1 per cent. of lignin, but urges that respiration experiments should be undertaken to ascertain the true factor.—W. Godden.

Nitrogenous Constituents

24

PERRIN, C. H. **Rapid modified procedure for determination of Kjeldahl nitrogen.** *Anal. Chem.*, 1953, **25**, 968–971. [Canada Packers, Ltd., Toronto.]

A study was made of the efficiency of digestion mixtures towards nicotinic acid and a new formula was devised, containing HgO, K₂SO₄ and H₂SO₄. The digestion time is 13 to 20 min. and the endpoint can be detected visually.—H. G. Bray.

- 25
RZYMOWSKA, C. J., BERNSTEINÓWNA, I. R. and GROCHOWSKA, J. H. Zastosowanie metod mikrochemicznych do badania artykułów żywności. 1. Mikrometoda i półmikrometoda Kjeldahla. [The use of microchemical methods in food research. 1. Kjeldahl micro- and semi-micromethod.] *Rocz. Państwowego Zakł. Hig.*, 1953, No. 1, 1-21. [Zakł. Badania Żywności, Warsaw.] Russian and English summaries.
- 26
BOWEN, T. J. Filter-paper electrophoresis of proteins. *Laboratory Practice*, 1953, **2**, 413-418. [Dept. Biochem., Univ. Leeds.]
- 27
WENZEL, M. and HANSON, H. Zur photoelektrischen Konzentrationsbestimmung von Serum-Eiweiss auf Papier. [Photoelectric estimation of the concentration of serum protein on paper.] *Hoppe-Seyler's Ztschr.*, 1953, **292**, 137-138. [Physiol. Chem. Inst., Martin-Luther-Univ., Halle a.d. Saale.]
The protein spots are stained with bromophenol blue and the intensity of transmitted light is measured photometrically.—H. G. Bray.
- 28
SENDROY, J. (Jr.) and CECCHINI, L. P. Analysis of electrophoretic protein fractions by the photoelectric areameter. *Arch. Biochem. Biophys.*, 1953, **45**, 161-168. [Div. Chem., Naval Med. Res. Inst., Bethesda, Md.]
- 29
COMMON, R. H., MCKINLEY, W. P. and MAW, W. A. Filter paper electrophoresis of avian serum proteins. *Science*, 1953, **118**, 86-89. [Dept. Agric. Chem., Macdonald Coll., McGill Univ., Que.]
The method described is based on those of Durum (*J. Amer. Chem. Soc.*, 1950, **72**, 2943) and Flynn and De Mayo (Abst. 3027, Vol. 21). The fractions obtained with poultry sera were compared with those given by human sera. The results are described and discussed in detail.
H. G. Bray.
- 30
FRANGLIN, G. T. An improved apparatus for the filter paper electrophoresis of serum and other proteins. *J. Clin. Pathol.*, 1953, **6**, 183-186. [Med. Unit, University Coll. Hosp. Med. Sch., London.]
The apparatus and its use are described in detail. Bands up to 25 cm. in width can be treated and a device is included which increases the range of buffers which can be used.—H. G. Bray.
- 31
WOODS, E. F. and GILLESPIE, J. M. A critical study of the use of paper electrophoresis for separating proteins and measuring their iso-electric points. *Austral. J. Biol. Sci.*, 1953, **6**, 130-141. [Biochem. Unit, Wool Textile Res. Lab., C.S.I.R.O., Melbourne.]
The effect of time, potential gradient, liquid flow and adsorption on the movement of proteins on paper was studied. The method described was applied to the measurement of the mobilities and iso-electric points of bovine plasma albumin and some enzymes of *Aspergillus oryzae*.—H. G. Bray.
- 32
EATON, J. C. and GARDNER, M. D. Separation of cerebrospinal fluid proteins by paper electrophoresis. *Biochem. J.*, 1953, **55**, xxv-xxvi. [Dept. Biochem., Glasgow Royal Infirmary.]
- 33
GIRI, K. V. Filter-paper disk chromatography. *Nature*, 1953, **171**, 1159. [Dept. Biochem., Indian Inst. Sci., Bangalore 3.]
A reply to a criticism of the procedure made by Proom and Woiwod (*Nature*, 1953, **171**, 42). Evidence is presented to show that the technique is applicable to the separation of amino-acids in protein hydrolysates if mixtures of *n*-butanol, acetic acid and water (40:10:50), pyridine and water (80:20) and pyridine, amyl alcohol and water are used as solvents.—H. G. Bray.
- 34
KIMBEL, K. H. and AMON, M. Über die Brauchbarkeit der Invertseifentitration zur Proteinbestimmung in biologischem Material. [On the possibility of using the invert soap titration to estimate protein in biological material.] *Hoppe-Seyler's Ztschr.*, 1953, **293**, 98-105. [Med. Klin., Univ. Würzburg.]
Seven ammonium bases, of which 6 were commercial disinfectants, were tested for their suitability for estimating the protein content of biological fluids. It was found that the invert soap titration with all the preparations tested gave reproducible results in pure protein solutions in the concentration range 0.02 to 0.2 per cent. This was shown for solutions of human albumin and γ -globulin. In each case there was linear dependence of the titration end-point on the protein concentration, but considerable differences were found in the values obtained for albumin and γ -globulin solutions of like concentration. The presence of certain urinary constituents in molar or 0.1 *M* concentration caused marked deviations in the results with all the preparations. In presence of Mg, precipitation of colloidal $Mg(OH)_2$ made titration impossible except in concentrations

below 0.01 *M*. The titration values of a 0.1 per cent. albumin solution showed a marked dependence on the hydrogen ion concentration between *pH* 7 and *pH* 13. The method cannot be recommended for the analysis of urine or serum.

M. B. Richards.

35

KARUNINA, L. and SHILOVICH, M. Proverka metodov bystrogo opredeleniya kolichestva belka v moloche. [Examination of methods for rapid estimation of protein in milk.] *Mol. Prom.*, 1953, 14, No. 2, 25-28. [Vse-Soyuz. Nauch-Issled. Inst. Mol. Prom.]

Comparison of the formaldehyde and amide N methods for estimating protein in milk, with the Kjeldahl method as control, indicated that the amide N method gives more accurate results but takes longer than the formaldehyde method. The protein content of bulked milk and milk from individual cows varied by the formaldehyde method between ± 5 per cent. of the Kjeldahl values, but with the amide N method 81 per cent. of the values differed from the Kjeldahl values by less than ± 3 per cent.—W. Hughes.

36

PERNIS, B. and WUNDERLY, C. Quantitative determination of amino acids on filter paper. Staining in two stages. *Biochim. biophys. Acta*, 1953, 11, 209-214. [Med. Clin., Univ. Cagliari, Italy.] French and German summaries.

The developed chromatogram is sprayed with a buffered ninhydrin reagent and the colour is developed. The spots are outlined, cut out and treated with a further amount of the reagent. After heating and cooling, propanol is added and the colour is measured photometrically. The necessary controls are described in detail.

H. G. Bray.

37

POLONOVSKI, M., PENARANDA, F. and ROBERT, L. Étude critique d'une méthode de dosage des acides aminés par chromatographie sur papier. [Critical study of a method for estimating amino-acids by paper chromatography.] *Bull. Soc. Chim. biol.*, 1953, 35, 801-806. [Lab. Biochim., Fac. Méd., Paris.]

Investigation of Naftalin's method for the estimation of amino-acids on paper chromatograms (Abst. 1598, Vol. 18) showed that the nature of the acid used for protein hydrolysis and the use of de-salting techniques had considerable effects on the results.—C. Warner.

38

PRIOR, A. P. and WHITEHEAD, T. P. Paper chromatography of amino-acids in cerebrospinal fluid. *Nature*, 1953, 172, 358-359.

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[S. Warwickshire Hosp. Group (No. 14), Group Pathol. Lab., Lakin Rd., Warwick.]

From the chromatographic estimation of amino-acids in cerebrospinal fluid, the fluid is freed from proteins and anions by passing it through a suitable cation exchange resin (Zeo-Karb 225). The amino-acids are retained on the column, from which they are displaced with ammonia. The resulting eluate is evaporated under reduced pressure and the dry residue, taken up with water, is used for paper chromatography. Cerebrospinal fluid of high protein content can be passed through the column without the *pH* changes in the column altering the free amino-acid pattern of the fluid. By combining this technique with the circular filter-paper method of paper chromatography, results can be obtained within 4 hr. of receiving the fluid. Preliminary results show that the method is suitable for serum and urine.

M. B. Richards.

39

CURZON, G. and GILTROW, J. A chromatographic colour reagent for a group of amino-acids. *Nature*, 1953, 172, 356-357. [Dept. Biochem., Inst. Orthopaedics, Brockley Hill, Stanmore, Middlesex.]

Vanillin followed by ethanolic potash has proved to be a chromatographic reagent of considerable specificity. The minimum detectable quantities of the substances giving well-defined colours in daylight, when run on 15 cm. one-way acetone-urea-water chromatograms, are, in $\mu\text{g.}$: ornithine 0.5, sarcosine 0.5, proline 1, hydroxyproline 1, α -pipecolic acid 1, baikiain 1, β -pipecolic acid 4 and γ -pipecolic acid 5. Ornithine gives a salmon spot about 30 sec. after heating commences. The other substances show up as red spots after about 6 hr. and reach maximum intensity in 16 hr.; β - and γ -pipecolic acids give comparatively faint colours. A large number of amino-acids tested gave indefinite or negative results.—M. B. Richards.

40

CHRISTOMANOS, A. A. Zur electrophotometrischen Papierchromatographie der Aminosäuren. [Electrophotometric paper chromatography of amino-acids.] *Enzymologia*, 1953, 16, 87-90. [2 Biochem. Abt., Univ. Athens.]

The intensity of the ninhydrin colour given by the bands is estimated by direct spectrophotometry. The method is applicable to autolysates, hydrolysates and clinical material.—H. G. Bray.

41

RAO, T. and GIRI, K. V. Circular paper chromatography. 5. The separation, identification and quantitative determination of urea with application to human urine.

GIRI, K. V., RADHAKRISHNAN, A. N. and VAIDYANATHAN, C. S. **6. The quantitative determination of amino acids.** *J. Indian Inst. Sci.* [A], 1953, **35**, 137-143; 145-180. [Dept. Biochem., Indian Inst. Sci., Bangalore 3.]

5. The developing solvent is a mixture of *n*-butanol, acetic acid and water (40:10:50). Half the developed chromatogram is sprayed with a phenol-hypochlorite reagent, the corresponding bands on the unsprayed half are cut out and eluted and the urea is estimated colorimetrically with α -isonitrosopropiophenone.

6. Previously described methods are reviewed and a method depending on circular paper chromatography is described in detail. The amino-acids separated with the mixture of *n*-butanol, acetic acid and water (40:10:50) are detected with ninhydrin and eluted with 75 per cent. ethanol containing copper sulphate, and the colour is compared with that given by a standard run simultaneously.—H. G. Bray.

42

WILTSHIRE, G. H. **The estimation of D- and L-glutamic acid in proteins.** *Biochem. J.*, 1953, **55**, 46-49. [Biochem. Lab., Univ. Cambridge.]

D-Glutamic acid was computed by difference, total glutamic acid being estimated by an ion exchange procedure with Amberlite IR-4B, and L-glutamic acid by enzymic decarboxylation. Five per cent. of L-glutamic acid is converted to the D-isomer during the preliminary treatment of proteins, but more than this was found in hydrolysates of alkali-treated protein and also in the cells of *Lactobacillus casei*, though not in several plant, animal and virus proteins studied.

H. G. Bray.

43

KOCH, R. and HANSON, H. **Zur Papierchromatographie von Glutamin- und Asparaginsäure. [Paper chromatography of glutamic and aspartic acids.]** *Hoppe-Seyler's Ztschr.*, 1953, **292**, 180-183. [Physiol. Chem. Inst., Martin-Luther-Univ., Halle a.d. Saale.]

It was shown by paper chromatography that glutamic and aspartic acids are esterified when kept in a solution containing ethanol and HCl. Neutral amino-acids are not affected.—H. G. Bray.

44

SCHRAM, E., DUSTIN, J. P., MOORE, S. and BIGWOOD, E. J. **Application de la chromatographie sur échangeur d'ions à l'étude de la composition des aliments en acides aminés. [Application of ion exchange chromatography to the study of the amino-acid content of foods.]** *Anal. chim. Acta*, 1953, **9**, 149-162.

[Lab. Biochim., Fac. Méd., Univ. Brussels.] English and German summaries.

The method used was that of Moore and Stein (Abst. 4469, Vol. 21) and is suitable for all common amino-acids except methionine, which is partly oxidised during acid hydrolysis, and tryptophan, for which no suitable method was found. Reference is made to a chromatographic method for the estimation of cysteine (as cysteic acid) in the presence of carbohydrate. Details are given of the application of the methods described to food materials.—H. G. Bray.

45

BAKER, C. G. and SOBER, H. A. **Application of ion exchange chromatography to enzymatic resolution of amino acids.** *J. Amer. Chem. Soc.*, 1953, **75**, 4058-4060. [Biochem. Lab., Nat. Cancer Inst., Bethesda, Md.]

The resins used are Dowex-50 and Amberlite XE-64. Asymmetric enzymic hydrolysis is applied to the N-acyl or amide derivatives of the amino-acids and the products are separated by elution from the column with water and with HCl. The procedure is applicable to amounts of the order of 0.3 to 1.0 g. The yields obtained ranged from 35 to 92 per cent.—H. G. Bray.

46

WALDSCHMIDT-LEITZ, E. and GAUSS, K. **Zur Bestimmung der carboxyl-endständigen Bausteine in Proteinen. [Estimation of protein constituents with end carboxyl groups.]** *Hoppe-Seyler's Ztschr.*, 1953, **293**, 10-16. [Inst. Org. Chem., Tech. Hochsch., Munich.]

Protein constituents with end carboxyl groups can be split off by carboxypeptidase, and identified by paper chromatography, taking into account the varying rates of enzymic separation of the different amino-acids, and their varying sensitivities towards ninhydrin. The method was applied to insulin and 3 different preparations of clupein. A suggestion is made for the nomenclature of proteins such that the constituents might be indicated by indices affixed to the name of the protein.—M. B. Richards.

47

JACOX, R. F. **Quantitative fractionation of component proteins of human serum with cationic detergents.** *J. Clin. Invest.*, 1953, **32**, 661-673. [Dept. Med., Sch. Med. Dent., Univ. Rochester, N.Y.]

The use of a cation detergent, octadecyldimethylbenzylammonium chloride ("Octab"), for the estimation of α -globulins, β - and γ -fractions, albumin and total protein is described. The procedure consists of treating diluted serum, 0.05 to

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0.12 ml. diluted a hundredfold, under specified conditions of pH and salt concentration and measuring the optical density of the mixtures obtained.—H. G. Bray.

48

BODE, F. Die quantitative Bestimmung des Aminostickstoffs. [Quantitative estimation of amino-nitrogen.] *Experientia*, 1953, 9, 271-272. [Frankfurt a.M.] English summary.

A colorimetric method is described, based on the reaction of the α -amino-groups with ninhydrin and copper nitrate to give a red colour which can be measured spectrophotometrically at 510 m μ . A developed chromatogram is sprayed with a ninhydrin reagent and, after heating, with an acid-ethanolic copper nitrate solution. After drying, the coloured compound is eluted from the appropriate portions of the chromatogram by methanol and the colour intensity is measured.

A procedure is described for the estimation of peptides in urine.—H. G. Bray.

49

MEYER, H. and RIKLIS, E. Influence of cations on the ninhydrin reaction for the determination of amino-acids. *Nature*, 1953, 172, 543. [Dept. Biol. Chem., Hebrew Univ., Jerusalem.]

Traces of certain cations affect the speed of ninhydrin colour development and the nature of the absorption spectra of the products. This effect can be eliminated by adding "Versene" (disodium salt of ethylene tetra-acetic acid) to the reaction mixture. A procedure is described.

H. G. Bray.

50

FRASER, D. and HIGGINS, H. G. Spectrophotometric determination of amino-groups. *Nature*, 1953, 172, 459-460. [Div. Forest Products, C.S.I.R.O., Melbourne.]

A spectrophotometric investigation was made of the reaction between diazotised sulphanilic acid and glycine, lysine, arginine and tryptophan. The use of this reaction in estimating the amino-groups of amino-acids and proteins is discussed.

H. G. Bray.

51

ZALTA, J. P. and KHOUVINE, Y. Dosage de la lysine, de la tyrosine et de l'arginine. [Estimation of lysine, tyrosine and arginine.] *Bull. Soc. Chim. biol.*, 1953, 35, 697-701. [Inst. Biol. Phys. Chim., Paris.]

The method for lysine depends on the fact that on treatment with chloramine T it yields a product which gives a blue colour with the Folin Ciocalteu reagent. Lysine, 7 to 30 μ g., can be estimated within 5 per cent. Histidine interferes, but a correction can be made.

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Tyrosine gives a cherry-red colour when treated with α -nitrosonaphthol. By the method described, based on this reaction, 5 to 30 μ g. tyrosine can be estimated within 3 per cent.

A modified Sakaguchi reaction is described for the estimation of arginine, applicable to amounts of 5 to 20 μ g. Urethane is used for the removal of excess hypobromite.—H. G. Bray.

52

UDENFRIEND, S. and COOPER, J. R. Assay of L-phenylalanine as phenylethylamine after enzymatic decarboxylation; application to isotopic studies. *J. Biol. Chem.*, 1953, 203, 953-960. [Lab. Chem. Pharmacol., Nat. Heart Inst., U.S. Pub. Health Serv., Bethesda, Md.]

The phenylalanine in tissues or protein hydrolysates is converted to phenylethylamine by incubation with an acetone powder preparation of *Streptococcus faecalis* obtained by Epps's method (*Biochem. J.*, 1945, 39, 42). It is extracted into chloroform containing 3.3 per cent. isoamyl alcohol and is estimated by a modification of the methyl orange procedure of Brodie and Udenfriend (*J. Biol. Chem.*, 1945, 158, 705). Details are given for the isolation of phenylethylamine hydrochloride from a hydrolysate of plasma proteins. It is obtained in sufficient quantity and purity for radio-active measurements after administration of 3-¹⁴C-DL-phenylalanine to animals or patients.

W. Godden.

53

KAWAMATA, J., TAKAHASHI, T. and YACHIKU, M. A microcolorimetric method for the determination of tryptophan with Tsuda's reagent. *Med. J. Osaka Univ. (Jap. Ed.)*, 1953, 5, 393-396. [Dept. Chemotherap., Inst. Microbial Dis., Univ. Osaka.] In Japanese: English summary.

The sample, 1 ml., containing tryptophan 0.005 to 0.25 mg., is treated with 1 ml. of 2*N* HCl and 1 ml. of 1 per cent. NaNO₂ at 30° C. for 30 min., the excess nitrous acid is decomposed with 4 ml. of 4 per cent. sulphamate, and 3 ml. of 0.2 per cent. 1-(β -diethylaminoethylamino)-naphthalene oxalate is added. The purple-red colour produced is estimated photometrically after 15 to 30 min. Kynurenine, anthranilic acid and abrine interfere, but not other amino-acids.—H. G. Bray.

54

FIGUEROA, E. S. and SEIBERT, F. B. Chromatography of α - ϵ -diaminopimelic acid on starch columns. *Proc. Soc. Exp. Biol. Med.*, 1953, 83, 535-537. [Henry Phipps Inst., Univ. Pennsylvania, Philadelphia.]

The amino-acid α - ϵ -diaminopimelic acid behaved like lysine when applied to starch columns; the

solvents used for application and elution were mixtures of *n*-butanol and *n*-propanol and 0.1 *N* HCl or *n*-propanol and 0.5 *N* HCl. Paper electrophoretic studies showed that the amino-acid migrated between glutamic acid and lysine in barbiturate buffer at *pH* 8.6.—G. A. Garton.

55

DAVIES, D. F., WOLFE, K. M. and PERRY, H. M. **Studies on primary amines. 1. Methods.** *J. Lab. Clin. Med.*, 1953, **41**, 802-811. [Dept. Int. Med., Sch. Med., Washington Univ., St. Louis, Mo.]

Primary amines separated from biological fluids can be estimated by paper chromatography, with a pyridine-ninhydrin detecting reagent. This may be used also for the spectrophotometric estimation of the amines.—W. G. Bray.

56

STELGENS, P. Über die Kreatinkörperbestimmung mit Kaliumquecksilberrhodanid und Dithizon. 2. [Estimation of creatine bodies with potassium mercury thiocyanate and dithizone. 2.] *Biochem. Ztschr.*, 1953, **324**, 228-236. [Kinderklin., Univ. Heidelberg.]

With the potassium mercury thiocyanate and dithizone method, previously described for pure solutions (Abst. 3872, Vol. 23), creatinine and creatine were estimated in amounts of blood which could easily be taken from the finger tip. For 10 healthy adults the average values obtained were 0.75 mg. per cent. creatinine and 2.13 mg. per cent. creatine. Creatine bodies were also estimated in normal urine, and in the urine of patients with progressive muscular dystrophy and of dystrophic infants. Comparison of the results with those obtained by the picrate method showed the greater specificity of the new procedure. Satisfactory recoveries of added creatinine and creatine were obtained with both blood and urine. Heating urines on a boiling-water bath may lead to loss of creatinine. Treatment for 24 hr. at 60° to 65° C. is more suitable.—M. B. Richards.

57

ENNOR, A. H. and STOCKEN, L. A. **The application of the diacetyl reaction to the estimation of creatine in urine.** *Biochem. J.*, 1953, **55**, 310-314. [Dept. Biochem., John Curtin Sch. Med. Res., Australian Nat. Univ., Canberra.]

The method depends on the measurement of the rate of colour development with α -naphthol and diacetyl, in samples of urine before and after enzymic removal of creatine and in similar samples containing added known amounts of creatine and creatinine. The calculation of the result is graphical.—H. G. Bray.

58

ROSCOE, M. H. **The estimation of creatinine in serum.** *J. Clin. Pathol.*, 1953, **6**, 201-207. [Dept. Med., Univ. Manchester.]

A detailed study of the Jaffé reaction. A standard method is described.—H. G. Bray.

59

WALL, J. S. **Simultaneous separation of purines, pyrimidines, amino acids and other nitrogenous compounds by ion exchange chromatography.** *Anal. Chem.*, 1953, **25**, 950-953. [Dept. Biochem., Coll. Agric., Univ. Wisconsin, Madison.]

A single column of Dowex-50 is used. The compounds under investigation are eluted with HCl and estimated by their ultraviolet spectra or by the ninhydrin reaction. It was found that 95 per cent. of the N of bacterial hydrolysates could be accounted for as 25 compounds.—H. G. Bray.

60

DEUTSCH, A. and NILSSON, R. **Separation of adenosine and inosine phosphates by paper chromatography.** *Acta chem. scand.*, 1953, **7**, 858-861. [Inst. Chem., Univ. Lund, Sweden.]

See also Absts. 6, 945.

Lipoid Constituents

61

FILLERUP, D. L. and MEAD, J. F. **Chromatographic separation of the plasma lipids.** *Proc. Soc. Exp. Biol. Med.*, 1953, **83**, 574-577. [Atomic Energy Project, Sch. Med., Univ. California, Los Angeles.]

Artificial mixtures of sterol esters, triglycerides, cholesterol, fatty acids and lecithin were effectively separated into their components by chromatography on silicic acid columns with increasingly polar eluents. The lipids were separated in the order given above by elution successively with 1, 4, 10 and 50 per cent. ether in light petroleum (b.p. 60° to 70° C.) and 25 per cent. methanol in ether. Human plasma lipids were similarly fractionated into sterol esters, triglycerides, sterols and phospholipids.

In a further experiment, 2 human subjects were each given 5 g. methyl β -elaeostearate by mouth; 4 hr. later blood was withdrawn from the antecubital vein and the plasma lipids were fractionated. β -Elaeostearic acid was found exclusively in the triglyceride fraction.—G. A. Garton.

62

HACK, M. H. **Analysis of lipids by spot tests on filter-paper disk chromatograms.** *Biochem. J.*, 1953, **54**, 602-605. [Dept. Anat., Univ. Chicago, Ill.]

A preliminary fractionation of lipids can be made by choosing a suitable solvent for the extraction of freeze-dried material. Chloroform-methanol mixture extracts total lipid, benzene extracts that not bound to protein and acetone extracts neutral fat, cholesterol and other non-phosphatide lipids. A spot of the lipid to be studied is applied to the centre of a filter paper disc and the chromatogram is developed by irrigation at the centre with solvent. Spot tests are described for the detection of choline lipids, amine lipids, acetal lipids (plasmalogens), phosphate esters, cholesterol and glycolipids. Plasmalogens were detected in some isolated lipids and in certain tissues.—H. G. Bray.

63

NÚÑEZ, G. and SPITERI, J. Chromatographie de partage des substances liposolubles. 1. Séparation des acides gras supérieurs. [Partition chromatography of fat-soluble substances. 1. Separation of higher fatty acids.] *Bull. Soc. Chim. biol.*, 1953, **35**, 851–857.

Chromatograph paper is treated with a solution of a triglyceride, e.g., triolein, tristearin, in a volatile solvent. The solvent is removed, an ethanolic solution of higher fatty acids is applied in the usual manner and the chromatogram is developed with ethanol containing water, which prevents solution of the stationary phase. The chromatogram is then treated with AgNO_3 solution, giving rise to Ag salts of the fatty acids which are insoluble in water, thus allowing excess reagent to be readily removed. Dilute ammonium sulphide solution is applied; this shows the positions of the fatty acids as black spots. Other substances (chloronaphthalene, iodobenzene) can be used as the stationary phase and other alcohols (methanol, propanol) as the mobile phase.—G. A. Garton.

64

VAN DE KAMER, J. H. Quantitative determination of the saturated and unsaturated higher fatty acids in fecal fat. *Scand. J. Clin. Lab. Invest.*, 1953, **5**, 30–36. [Central Inst. Nutrit. Res. T.N.O., Utrecht.]

A quantity, 5 to 20 g., of wet faeces from a 24-hr. sample is saponified with ethanolic KOH and the unsaponifiable matter is removed with light petroleum. HCl is added to liberate the fatty acids, which are extracted with light petroleum. After a rough titrimetric estimation of the fatty acid content, a volume of light petroleum solution containing about 0.5 m. equiv. fatty acids is exactly neutralised with 0.1 N ethanolic NaOH, using thymol blue as indicator. The solvents are removed, leaving the Na soaps, the iodine value of which is estimated. Taking 282 as the average mol. wt. of unsaturated fatty acids and 270 as that of

the saturated acids, the amounts of each excreted per 24 hr. can be calculated.—G. A. Garton.

65

KIBRICK, A. C. and SKUPP, S. J. Colorimetric method for the determination of fatty acids in blood by oxidation with dichromate. *Arch. Biochem. Biophys.*, 1953, **44**, 134–139. [Dept. Chem., Coll. Med., Univ. New York.]

A light petroleum extract of blood fatty acids, prepared by Bloor's method (*J. Biol. Chem.*, 1939, **82**, 273) is evaporated to dryness in a test tube. To the tube are added 2 ml. of N potassium dichromate and then 4 ml. of concentrated H_2SO_4 . After mixing, the tube is heated for 20 min. in a pressure cooker at 15 lb. pressure and the cooled contents are made up to 10 ml. The optical density is measured at 600 m μ . and the concentration of fatty acid is calculated by reference to a standard curve. The standard curves for 0.2 to 1.5 mg. amounts of oleic and palmitic acids are almost identical.—G. A. Garton.

66

HERB, S. F. and RIEMENSCHNEIDER, R. W. Spectrophotometric micromethod for determining polyunsaturated fatty acids. *Anal. Chem.*, 1953, **25**, 953–955. [E. Reg. Res. Lab., Philadelphia, Pa.]

An accurately weighed sample, 1 to 10 mg., of fat is introduced into a tube containing 5.0 g. of 21 per cent. KOH in ethylene glycol and the tube is heated in a bath at 180° C. for 15 min. The tube is then rapidly cooled and the isomerised mixture is diluted with absolute methanol before measurement of the extinction coefficient at the appropriate wavelength in a Beckman spectrophotometer. By this method the estimation of linoleic, linolenic, arachidonic and pentaenoic acids gave good reproducibility and good agreement with similar macro-methods employing 100 mg. fat.—G. A. Garton.

67

HANSEN, R. P. and COOKE, N. J. The isolation of lauric acid from butter fat. *J. Sci. Food Agric.*, 1953, **4**, 351–352. [Fats Res. Lab., D.S.I.R., Wellington, N.Z.]

Methyl ester fractions, derived from butterfat and calculated from saponification equivalents to contain a preponderance of lauric acid, were bulked and fractionated chromatographically. Fractions with saponification equivalents approximating to that of lauric acid were converted to fatty acids and crystallised from different solvents at low temperatures to yield *n*-dodecanoic (lauric) acid, which was characterised by elementary analysis, X-ray long spacing and the preparation of suitable derivatives.—G. A. Garton.

- 68
BIGGS, D. A. and BRYANT, L. R. **The thiobarbituric acid test for butterfat oxidation.** *Canad. J. Technol.*, 1953, **31**, 138-145. [Grad. Sch., Univ. Toronto.]
- 69
STINE, C. M., HARLAND, H. A., COULTER, S. T. and JENNESS, R. **An improved method of determining peroxide values of butterfat in dry and fluid milk.** *J. Dairy Sci.*, 1953, **36**, 561. *Proc.* [Univ. Minnesota, St. Paul.]
- 70
FEULGEN, R., BOGUTH, W. and ANDRESEN, G. Bemerkungen zur Bestimmung der Acetalphosphatide (Plasmalogen) im Serum. [Remarks on the estimation of acetal phosphatides (plasmalogens) in serum.] *Hoppe-Seyler's Ztschr.*, 1953, **293**, 79-82. [Physiol. Chem. Inst., Akad. Med. Forsch., Justus-Liebig-Hochsch., Giessen.]
- 71
CHRISTL, H. Quantitative Bestimmung der Acetalphosphatide in Organen. [Estimation of acetal phosphatides in organs.] *Hoppe-Seyler's Ztschr.*, 1953, **293**, 83-88. [Physiol. Chem. Inst., Akad. Med. Forsch., Justus-Liebig-Hochsch., Giessen.]
- 72
DESPAUL, J. E., WEINSTOCK, A. and COLEMAN, C. H. **Phosphoric acid determination. Colorimetric method for lipid phosphoric acid in eggs and noodles.** *J. Agric. Food Chem.*, 1953, **1**, 621-626. [Quartermaster Inspection Serv. Field Office, Chicago 9, Ill.]
The colorimetric method described uses 1-amino-2-naphthol-4-sulphonic acid. Lipoid material is extracted from the material under investigation by ethanol, digested with a mixture of H_2SO_4 and HNO_3 , neutralised and analysed for phosphate.
Frozen egg yolk may be refrigerated for 36 months and noodles for 6 months without appreciable deterioration of phospholipins.—H. G. Bray.
- 73
BUGNARD, L., CHEVALLIER, F. and COURSAGET, J. Préparation, extraction et dosage de cholestérol marqué (D et C^{14}). [Preparation, extraction and estimation of cholesterol labelled with deuterium and ^{14}C .] *J. Physiol., Paris*, 1953, **45**, 463-469. [Lab. Isotopes, Groupe Hosp. Necker-Enfants Malades, Paris.]
- 74
CAMA, J. S., CHAKRABARTY, M. M., HILDITCH, T. P. and MEARA, M. L. **The separation of glyceride concentrates from natural fats by crystallization from solvents.** *J. Sci. Food Agric.*, 1953, **4**, 321-328. [Univ. Liverpool.]
Artificial fat mixtures of approximately known composition were prepared from concentrates of different types of mixed glycerides, including palmitostearins (trisaturated), oleopalmitostearin, oleodipalmitin, and oleodistearin (disaturated-monounsaturated), palmitodiolein and steardiolein (monosaturated-diunsaturated) and oleolinoleins (triunsaturated).
Each mixture was systematically crystallised from 10 per cent. solution in acetone at low temperatures, starting at -60° or -70° C.; the temperatures of succeeding crystallisations of deposited solids were gradually raised until crystallisations at 0° C. and above were undertaken. In this way a considerable number of glyceride fractions were obtained, each of which was analysed for component fatty acids.
The results, in general, accorded well with the proportions of glycerides known to be present. In addition, the trisaturated glyceride content of a fat was the same whether it was estimated by crystallisation or chemically by permanganate-acetone oxidation of the unsaturated components. Further, the amount of simple triglyceride, saturated or unsaturated, present in seed fats was directly related to the proportion of the fatty acid concerned in the total fatty acids of the fat.
G. A. Garton.
- Other Organic Constituents
- 75
HULLIN, R. P. and NOBLE, R. L. **The determination of lactic acid in microgram quantities.** *Biochem. J.*, 1953, **55**, 289-291. [Dept. Biochem., Univ. Leeds.]
A modification of the method of Barker and Summerson (Abst. 831, Vol. 11) is described, by means of which from 1 to 8 μg . lactic acid can be estimated within 2 per cent. With slight modification it can be used for the estimation of lactic acid in the presence of pyruvic acid. The protein-free solution under investigation is treated with copper sulphate and lime and the supernatant is shaken with more $CuSO_4$ and H_2SO_4 , heated at 60° C., treated with a *p*-hydroxydiphenyl reagent and incubated at 28° to 30° C. The resulting violet colour is measured spectrophotometrically.
H. G. Bray.
- 76
KOTTMEYER, G. Fehlermöglichkeiten bei der Bestimmung kleinster Milchsäuremengen. [Sources of error in the estimation of very small quantities of lactic acid.] *Biochem. Ztschr.*, 1953, **324**, 160-164. [Med. Akad., Justus-Liebig-Hochsch., Giessen.]

In the method previously described (Abst. 89, Vol. 22), several points have been investigated further. The oxidation with KMnO_4 in presence of MnSO_4 cannot be replaced by other procedures. The distillation should be in a current of N_2 , since the O_2 of the air causes loss of acetaldehyde. Titration errors can be avoided only if, in an acid medium, the bisulphite solution is added to the I solution, and not vice versa. Only this procedure gives a quantitative oxidation of the sulphite to sulphate. The magnitude of the blank analysis depends on the method of titration and oxidation, and on the purity of the reagents. Approved methods for deproteinisation are indicated.—M. B. Richards.

77

KLEINERT, J. Die Bestimmung der Milchsäure in biologischem Material. [Estimation of lactic acid in biological material.] *Mitt. Geb. Lebensmittel Hyg.*, 1953, **44**, 232–247. [Zürich.] French and English summaries.

The method of Davidson (Abst. 4381, Vol. 19) was found to be most suitable.—H. G. Bray.

78

TURNOCK, D. Paper chromatography of keto-acids. *Nature*, 1953, **172**, 355–356. [Dept. Surg., Univ. Liverpool.]

In testing the specificity of the method of Friedemann and Haugen (Title 16, Vol. 13) for the estimation of blood pyruvic acid, chromatograms of the hydrazones from blood were run with the hydrazones of pyruvic acid, phenylpyruvic acid, α -ketoglutaric acid, acetoacetic acid and acetone. The average R_F values at room temperature for the hydrazones of these keto-compounds, in the above order, were 0.58, 0.84, 0.12, 0.60 and 1.00. The hydrazones of blood always gave 4 spots, 2 corresponding to pyruvate hydrazone, and 2 smaller, faster-running spots, which were identified as phenylpyruvate hydrazone. Blood analysed by the method of Cavallini (Abst. 1729, Vol. 19) showed, in addition to those 4 spots, a spot corresponding to α -ketoglutaric acid and a suspicion of 2 other spots with R_F values 0.44 and 0.73. It appears, therefore, that the method of Friedemann and Haugen allows separation of pyruvate with some phenylpyruvate from the other keto-acids in blood, in a way more specific than the method of Cavallini.

M. B. Richards.

79

KOGAN, L., DiCARLO, F. J. and MAYNARD, W. E. Determination of caffeine and trigonelline in coffee by paper chromatography. *Anal. Chem.*, 1953, **25**, 1118–1120. [Fleischmann Labs., Standard Brands, Inc., New York.]

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80

HOLDEN, M. A comparison of the applicability to plant extracts of three methods of determining deoxyribonucleic acid. *Analyst*, 1953, **78**, 542–550. [Rothamsted Exp. Stat., Harpenden, Herts.]

81

KOCZNOŹOWSKI, H. and ŹYSZCZYŃSKA, B. Opracowanie szybkiej i dokładnej metody ilościowego oznaczania formaldehydu w artykułach żywności. [A rapid and precise method of quantitative estimation of formaldehyde in foods.] *Rocz. Państwowego Zakł. Hig.*, 1953, No. 1, 99–110. [Zakł. Badania Żywności, Warsaw.] Russian and English summaries.

Inorganic Constituents

82

CANNY, R. E. Note on the determination of ash in non-fat dry milk solids. *J. Assoc. Off. Agric. Chem.*, 1953, **36**, 558–560. [Food and Drug Admin., Fed. Sec. Agency, Minneapolis, Minn.] A comparison of 2 methods of ashing (A.O.A.C. methods 15-96 and 15-97) showed that the results did not differ significantly.—H. G. Bray.

83

MATHIS, W. T. Spectrochemical analysis of plant material using spark excitation. *Anal. Chem.*, 1953, **25**, 943–947. [Connecticut Agric. Exp. Stat., New Haven.]

Cratered electrodes packed with graphite impregnated with the solution under investigation are used. The calculation of results is described in detail.—H. G. Bray.

84

BARLOW, J. S. and MANERY, J. F. A comparison of the method of flame photometry with the chemical methods for the determination of cations in tissues. *Canad. J. Med. Sci.*, 1953, **31**, 326–337. [Dept. Biochem., Univ. Toronto.]

Modifications of earlier methods and necessary precautions are discussed, including the Li concentration of the internal standard, the rate of flow through the atomiser, gas and air pressures and interference by cations. With the methods recommended results were obtained which compare favourably with those given by wellknown chemical methods.—H. G. Bray.

85

MIDDLETON, G. and STUCKEY, R. E. The preparation of biological material for the determination of trace metals. 1. A critical review of existing procedures. *Analyst*, 1953, **78**, 532–542. [British Drug Houses, Ltd., Graham St., London, N.I.]

86

- VAN ERKELENS, P. C. **Quantitative paper chromatography of traces of metal with the aid of radioactive hydrogen sulphide.** *Nature*, 1953, **172**, 357-358. [Res. Inst. Animal Husb., T.N.O., Utrecht.]

The method outlined for the estimation of traces of metals is to be described in detail elsewhere. It has a sensitivity comparable to that of spectrography, is not costly, and can be performed on a large scale, partly automatically.—M. B. Richards.

87

- HEGGEN, G. E. and STROCK, L. W. **Determinations of trace elements. Combining chemical enrichment and spectrochemical methods.** *Anal. Chem.*, 1953, **25**, 859-863. [Albany Med. Coll., N.Y.]

Indium, the internal standard, is added to a solution of the material being studied; this is then treated with 8-hydroxyquinoline, which precipitates most trace elements. The precipitate is collected and ashed and the residue is examined spectrographically.—H. G. Bray.

88

- LINHARDT, K. and LAUTERBACH, I. **Die Bestimmung kleinster Arsenmengen in biologischem Material. [Estimation of small amounts of arsenic in biological material.]** *Hoppe-Seyler's Ztschr.*, 1953, **292**, 207-212. [Chem. Inst., Städt. Krankenhaus, Nürnberg.]

89

- NORRIS, W. P. and LAWRENCE, B. J. **Determination of calcium in biological materials. A combined method for semimicrodetermination of Ca^{40} and radioassay of Ca^{45} .** *Anal. Chem.*, 1953, **25**, 956-960. [Div. Biol. Res., Argonne Nat. Lab., Lamont, Ill.]

The sample is ashed, the ash is dissolved in HCl and the Ca is precipitated as oxalate. This is mounted on a fritted glass disc by filtration under carefully controlled conditions. After counting, the precipitate is dissolved in HClO_4 and total Ca is estimated by titration with hexanitrate-ammonium cerate, with Setopaline C as indicator.

H. G. Bray.

90

- COMAR, C. L., MONROE, R. A., VISEK, W. J. and HANSARD, S. L. **Comparison of two isotope methods for determination of endogenous fecal calcium.** *J. Nutrition*, 1953, **50**, 459-467. [Univ. Tennessee-Atomic Energy Comm., Agric. Res. Program, Oak Ridge.]

Endogenous faecal Ca has been estimated in cattle by an isotope dilution method (Abst. 804, Vol. 24). The results were compared with those

obtained by a comparative balance method which is described and discussed. It depends upon a knowledge of the proportion of ingested ^{45}Ca which does not take part in metabolic exchange with stable ions and is excreted in the faeces, and upon estimations of total faecal Ca and faecal ^{45}Ca when ^{45}Ca is included in the diet. The major assumption made is that the source of labelled Ca is absorbed to the same degree as other dietary Ca.

The mean daily endogenous faecal Ca from a group of cattle was 5.7 ± 0.51 g. for the first method and 5.2 ± 0.53 g. for the second.—R. Hill.

91

- HARRISON, G. E. and RAYMOND, W. H. A. **The determination of microgram amounts of calcium.** *Analyst*, 1953, **78**, 528-531. [Med. Res. Counc., Radiobiol. Res. Unit, Atomic Energy Res. Establishment, Harwell, Didcot, Berks.]

The method is based on the precipitation of Ca as its molybdate, which is separated by centrifuging and converted to molybdenum thiocyanate. This is extracted with isoamyl alcohol and estimated absorptiometrically. The method is particularly useful for estimating Ca in serum from young children or small laboratory animals. As little as $4 \mu\text{g}$. Ca can be estimated to within ± 10 per cent. The presence of phosphate, ferric or ferrous Fe, Mg, Cu or Al does not affect the estimation.—W. Godden.

92

- SCHLÜTZ, G. O. **Die quantitative flammenphotometrische Bestimmung des Calciums im Blutserum. [Quantitative estimation of calcium in blood serum by flame photometry.]**

Die quantitative flammenphotometrische Halbmikrobestimmung des Calcium in 0.1 cm^3 enteweißtem Vollblut. [Quantitative semimicro-estimation of calcium in 0.1 c.c. deproteinised whole blood by flame photometry.] *Schweiz. med. Wochenschr.*, 1953, **83**, 383-384; 452. [Diagnostisches Inst., Freiburg i. Br.]

93

- RIETHMÜLLER, H. U. and BRETSCHNEIDER, A. **Zur Fehlerbreite der flammenphotometrischen Calcium - Bestimmung in menschlichen Serum (und Urin). [On the range of error in the estimation of calcium in human serum (and urine) by the flame photometer.]** *Hoppe-Seyler's Ztschr.*, 1953, **293**, 49-62; *Klin. Wochenschr.*, 1953, **31**, 527-528. [Med. Klin., Univ. Tübingen.]

In considering the suitability of the flame photometer method for serum Ca estimations in routine clinical work, the authors point out that previous estimations of the range of error have

been based mainly on repeated analyses of inorganic salt solutions or of the same serum, without regard to the complexity of the biological material concerned. The method was therefore investigated for its reliability when applied to single analyses of different sera.

Thirty successive estimations, in which the average deviation from the mean was ± 0.9 per cent., showed the consistency of the results obtainable from one serum. But comparison of the results on 500 different sera with the results obtained on the same sera by a reliable acidimetric titration method showed that there was considerable deviation from those obtained chemically. The sera were divided into groups of low, normal and high Ca content, and the deviations were smallest in the normal-Ca group (± 4.5 per cent.), and largest in the low-Ca group (± 6.9 per cent.). These divergent values are due to the changing conditions of the complex substrate under examination. Of 300 different sera which gave normal values acidimetrically, 12.7 per cent. gave values outwith the normal range by the flame photometer method, 6.7 per cent. below and 6.0 per cent. above. The apparatus and procedure used have only a limited applicability for serum Ca estimations, and are not applicable for urinary Ca analyses. The flame photometric results for 100 urines showed deviations of ± 23 per cent. from those obtained chemically.—M. B. Richards.

94

WILLIAMS, T. R. and MORGAN, R. R. T. **The determination of calcium in plant material by the flame photometer.** *Chem. and Indust.*, 1953, No. 37, 970. [Nat. Agric. Advisory Serv., Wye, Kent.]

A rapid and accurate method is described. The material is ashed with nitric and perchloric acids, the ash is dissolved in water and Ca is precipitated as oxalate under standard conditions. The oxalate is isolated and dissolved in 0.04 N nitric acid and Ca is estimated in the solution photometrically. The results obtained by this procedure agree favourably with those by a macro-volumetric procedure.—H. G. Bray.

95

FAUCHERRE, J. **Détermination qualitative rapide des cations alcalino-terreux. [Rapid qualitative estimation of alkaline earth cations.]** *Bull. Soc. chim. France*, 1953, No. 9, 900-902. [Lab. Pract. Chem., Sorbonne, Paris.]

Ba, Sr, Ca or Mg can be estimated without preliminary separation from other elements, with "trilon B" (ethylenediamine tetra-acetic acid). Ba is precipitated as its croconate, Ca as oxalate, Sr as sulphate and Mg as its thiazole yellow derivative.—H. G. Bray.

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96

DAVIS, L. R. and SMITH, M. J. H. **Difficulties in the use of ethylenediamine tetra-acetic acid (E.D.T.A.) in determining calcium in serum.** *J. Clin. Pathol.*, 1953, 6, 198-200. [Dept. Chem. Pathol., King's Coll. Hosp. Med. Sch., Denmark Hill, London.]

It is concluded that the method is not suitable for routine clinical work.—H. G. Bray.

97

JENNESS, R. **Titration of calcium and magnesium in milk and milk fractions with ethylenediamine tetraacetate.** *Anal. Chem.*, 1953, 25, 966-968. [Dept. Agric. Biochem., Univ. Minnesota, St. Paul.]

The milk sample is ashed and interfering phosphate is removed by anion exchange with Duolite A-4. Ca and Mg are then estimated in the effluent by titration with ethylenediamine tetra-acetate, using Eriochrome Black T as indicator.

H. G. Bray.

98

BREYER, B. and MCPHILLIPS, J. **An indirect polarographic determination of calcium.** *Nature*, 1953, 172, 257. [Physico-chem. Labs., Fac. Agric., Univ. Sydney.]

The method is applicable to blood, milk and serum ash. Ca is precipitated quantitatively by means of chloranilic acid, the pH of the resulting mixture is adjusted to 4.5 and the polarographic diffusion current of the residual chloranilic acid is measured directly. The method can be used in the presence of Co, Pb, Zn, Mn, Cd, Ni, Al, Cu and Ag. Ferric Fe, mercuric Hg, Mg, Li, Ba, Cr and Sr interfere if their concentrations are above certain levels.—H. G. Bray.

99

STRENGERS, T. and ASBERG, E. G. M. T. **Een snelle microchlorbepaling. [Rapid micro-method for estimating chlorine.]** *Nederland. Tijdschr. Geneesk.*, 1953, 97, 2018-2020. [Clin. Chem. Lab., Onze Lieve Vrouwe Gasthuis, Amsterdam.]

100

KING, R. P., BOLIN, D. W., DINUSSON, W. E. and BUCHANAN, M. L. **A chromatographic method for the determination of cobalt in feeds.** *J. Animal Sci.*, 1953, 12, 628-634. [Dept. Animal Husb., N. Dakota Agric. Coll.]

Interference by orthophosphates is reduced by the use of perchloric acid in the preparation of the extract, and the presence of pyrophosphates must be avoided. After development of the colour complex with nitroso R salt the entire solution is passed through an alumina column and excess of reagent is removed with HNO_3 . The complex is

then eluted with H_2SO_4 and estimated colorimetrically by comparison with a curve for known amounts of Co similarly treated. The need for removing Fe and Cu is eliminated.—D. Harvey.

101

STONE, I., ETTINGER, R. and GANTZ, C. **Nonashing technique for determination of traces of copper in malt beverages.** *Anal. Chem.*, 1953, **25**, 893–895. [Wallerstein Labs., New York 16.]

A 50-ml. centrifuge tube is used for the entire procedure. The beer sample (25 ml.) is transferred to the tube and heated in a boiling-water bath with dilute H_2SO_4 to reduce difficulties due to emulsification. The cooled solution is then treated with a solution of Zn dibenzylthiocarbonate in CCl_4 . After shaking, the yellow-brown solvent layer is removed for photometric estimation.—H. G. Bray.

102

VENKATESWARLU, P. and RAMANATHAN, A. N. **A rapid titrimetric procedure for estimation of fluorine in potable water.** *Indian J. Med. Res.*, 1952, **40**, 549–554. [Dept. Biochem., Andhra Med. Coll., Visakhapatnam.]

Water is treated with NaCl to reduce interference from ions and titrated directly with thorium nitrate, using alizarin S as indicator. A calibration curve may be used in calculating results.

H. G. Bray.

103

GRUTSCH, J. F., NEBERGALL, W. H., MUHLER, J. C., FISCHER, R. B. and DAY, H. G. **A procedure for the routine determination of fluorine in potable waters containing iron, manganese, aluminium, and chlorine.** *J. Dent. Res.*, 1953, **32**, 463–468. [Dept. Chem., Indiana Univ., Bloomington.]

A modification of the method of Sanchis and Scott, involving the preliminary treatment of the sample with thioglycolic acid, which reduces Fe, Mn and Cl to forms which do not interfere. Interference by Al ions may be reduced by suitable dilution. In the method described the colours produced with a zirconium-alizarin reagent are compared, with Nessler tubes or a spectrophotometer.—H. G. Bray.

104

ROWLEY, R. J., GRIER, J. G. and PARSONS, R. L. **Determination of fluoride in vegetation.** *Anal. Chem.*, 1953, **25**, 1061–1065. [Aluminium Res. Labs., Aluminium Co. of America, New Kensington, Pa.]

The usual methods for estimating plant fluorides give low values for material containing much silica. The intractable fluoride-containing material can be decomposed by alkali fusion. A method using

this is described. HF is distilled from the ashed material and titrated with thorium nitrate, with sodium alizarin sulphonate as indicator.

H. G. Bray.

105

FRAZIER, R. E. and OLDFIELD, H. G. **Rapid method for distilling fluorides from water samples.** *Pub. Health Rep., Washington*, 1953, **68**, 729–731. [Eng. Labs. Sect., Div. Environmental Sanitation, Dept. Health, Minn.]

An apparatus and procedure are described in detail. The time required is less than 30 min.

H. G. Bray.

106

FURRER, H. and STAUB, M. Die Mikrojodbestimmung in jodiertem Kochsalz. [**Microestimation of iodine in iodised cooking salt.**] *Mitt. Geb. Lebensmittel. Hyg.*, 1953, **44**, 252–256. [Kantonal. Lab., Zürich.] French and English summaries.

The method described depends on the oxidation by Br of iodide to iodate and its titration with thiosulphate in the presence of formic acid.

H. G. Bray.

107

KIRKPATRICK, H. F. W. **The determination of iodine in blood serum.** *Analyst*, 1953, **78**, 348–353. [Dept. Clin. Invest., London Clin., 20 Devonshire Pl., London, W.1.]

Certain modifications of the method of Chaney (Abst. 52, Vol. 10) are suggested. The mean recovery of I in 40 duplicate estimations in sera was 100 per cent. Protein-bound I in the sera of 40 normal subjects ranged from 3.9 to 7.8 $\mu g.$ per 100 ml. with an average of 5.9 $\mu g. \pm 0.85$.

B. W. Simpson.

108

GRAT-CABANAC, M. Contribution au dosage colorimétrique du fer (note de laboratoire). [**The colorimetric estimation of iron: laboratory note.**] *Bull. Soc. chim. France*, 1953, No. 9, 856–857. [Fac. Sci., Toulouse.]

By adding indigo or methylene blue to the red solutions given by decreasing amounts of ferric iron with thiocyanate or $\alpha\alpha'$ -dipyridyl a range of colours from pink to pale blue can be obtained. It is suggested that these may be used to estimate Fe without the use of a colorimeter.—H. G. Bray.

109

ANDREWS, J. and STRINGER, W. J. **Colorimetric determination of trace metals in beer and in brewing materials. 5. Determination of iron.** *J. Inst. Brewing*, 1953, **59**, 211–212. [Arthur Guinness, Ltd., St. James's Gate Brewery, Dublin.]

110

FORSTER, W. A. **The determination of nickel in plant material in the presence of other metals.** *Analyst*, 1953, **78**, 560-562. [Agric. Res. Counc. Unit Plant Nutrit., Long Ashton Res. Stat., Bristol.]

Two methods were examined. That of ter Haar and Westerveld (*Rec. Trav. chim. Pays-Bas*, 1948, **67**, 71) showed interference by Cu and Mn and gave turbid extracts. In Sandell's method ("Colorimetric Determination of Traces of Metals", Interscience Publishers, Inc., New York, 1947) only Cu interfered. It is now shown that if Sandell's method for extracting the Ni is combined with the formation of the Ni dimethylglyoxime complex as used in the first method a procedure results that is free from interferences, and the stable colour developed obeys Beer's law from 0 to 50 μg . Ni.
W. Godden.

111

PONS, W. A., STANSBURY, M. F. and HOFFPAUIR, C. L. **An analytical system for determining phosphorus compounds in plant materials.** *J. Assoc. Off. Agric. Chem.*, 1953, **36**, 492-504. [S. Reg. Res. Lab., New Orleans, La.]

Detailed procedures are described for the estimation of total, acid-soluble, phosphatide, phytin, nucleic acid and ester P. The fundamental analytical methods are a reduced molybdate and an isobutanol molybdate method.—H. G. Bray.

112

TAUSSKY, H. H. and SHORR, E. (with KURZMANN, G.) **A microcolorimetric method for the determination of inorganic phosphorus.** *J. Biol. Chem.*, 1953, **202**, 675-685. [Russell Sage Inst. Pathol., New York.]

The procedure described is applicable to serum, urine, cerebrospinal fluid and stool ash, and may be used for the measurement of phosphatase activity. The prepared sample is treated with a mixture of ferrous sulphate and molybdate and the blue colour is measured colorimetrically: the range of the method is from 2 to 40 μg . P.
H. G. Bray.

113

KELEK-BAČOKA, M. **Fotometrijsko određivanje kalija u biološkim tekućinama. [Quantitative estimation of potassium in biological fluids.]** *Acta med. jugoslav.*, 1953, **7**, 63-69. [Clin. Med., Fac. Med., Zagreb.] English summary.

A quick photometric method is described by which K in body fluids is precipitated in buffered solution, bound as potassium silver hexanitrocobaltate. (From summary.)—E. M. Hume.

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114

BAAR, S. **A colorimetric method for the micro-determination of potassium in serum.** *Analyst*, 1953, **78**, 353-356. [Med. Res. Counc. Indust. Injuries and Burns Res. Unit, Birmingham Accident Hosp., Bath Row, Birmingham 15.]

The cobaltinitrite derivative is precipitated from serum without removal of protein, isolated, and dissolved in sulphamic acid to remove nitrous acid. The Co present is converted to its 8-hydroxyquinoline derivative, which is extracted with chloroform and estimated photometrically in a Spekter instrument at 403 $m\mu$. with Ilford 601 and Kodak Wratten 35 filters.—H. G. Bray.

115

HOLIDAY, E. R. and PREEDY, J. R. K. **The precision of a direct-reading flame photometer for the determination of sodium and potassium in biological fluids.** *Biochem. J.*, 1953, **55**, 214-220. [Spectrographic Unit, Med. Res. Counc., London Hosp.]

A suitable direct-reading flame photometer is described, with the results of spectroscopic analysis of the flame emitted and of a study of the efficiency of different combinations of filters. The efficiency of the method as applied to urine and serum was investigated, especially with regard to interference.

H. G. Bray.

116

AITKEN, E. H. and PREEDY, J. R. K. **The presence of potassium as a source of inaccuracy in the chemical estimation of sodium in urine.** *Biochem. J.*, 1953, **55**, 211-213. [Med. Unit Labs., London Hosp.]

In the zinc uranyl acetate method for the estimation of Na in urine interference due to co-precipitation of K occurs when the Na : K ratio is small and not necessarily when the K concentration is high. Flame-photometric measurements were used for the estimation of the Na : K ratio.

H. G. Bray.

117

ANDERSEN, L. **A spectrophotometric method for the determination of sulphate and organic sulphur on the micro- and ultramicroscale.** *Acta chem. scand.*, 1953, **7**, 689-692. [Inst. Chem., Univ. Helsinki.]

Sulphate is precipitated with benzidine, the precipitate is isolated and dissolved in HCl and the absorption of the solution is measured spectrophotometrically. Organic S is first converted to sulphate by treatment with HNO_3 . A micro-method for 0.1 to 0.01 *N* solutions of sulphate and an ultramicro-method for smaller quantities, 1 to 25 μg . S, are described.—H. G. Bray.

118

- GRUSZCZYŃSKI, T. and SŁOMIŃSKA-CZYŻOWA, E. Ocena krytyczna metody G.W. Monier-Williamsa oznaczania kwasu siarkawego w artykułach spożywczych. [Critical study of the method of G. W. Monier-Williams for estimating sulphuric acid in food products.] *Rocz. Państwowego Zakł. Hig.*, 1953, No. 1, 115-120. [Odział. Badania Żywności, Kielcach.] Russian and French summaries.

119

- WEITZEL, G. and FRETZDORFF, A. M. Zinkbestimmung in biologischem Material. [Estimation of zinc in biological material.] *Hoppe-Seyler's Ztschr.*, 1953, 292, 212-221. [Med. Forschungsanst., Max Planck Gesellsch., Göttingen.]

Enzyme Activity

120

- GUTH, P., KOMAROV, S. A. and SHAY, H. Phototurbidimetric determination of pancreatic amylase. *Amer. J. Physiol.*, 1953, 173, 461-466. [Samuel S. Fels Res. Inst., Sch. Med., Temple Univ., Philadelphia, Pa.]

121

- PARKS, R. E. (Jr.) and PLAUT, G. W. E. A manometric assay for chymotrypsin. *J. Biol. Chem.*, 1953, 203, 755-761. [Dept. Biochem., Coll. Agric., Univ. Wisconsin, Madison.]

122

- MATTENHEIMER, H. Tetracolin-Phenolphthalein-Phosphat als Substrat zur Phosphatasebestimmung. [Tetracolin-phenolphthalein-phosphate as substrate in phosphatase estimation.] *Naturwissenschaften*, 1953, 40, 460-461. [Physiol. Chem. Inst., Univ. Berlin.]

123

- KAPLAN, A. and NARAHARA, A. The determination of serum alkaline phosphatase activity. The determination of serum acid phosphatase activity. *J. Lab. Clin. Med.*, 1953, 41, 819-824; 825-828. [Dept. Biochem., Med. Res. Inst., Michael Reese Hosp., Chicago, Ill.]

124

- BRANDENBERGER, H. and HANSON, R. Eine spektrophotometrische Bestimmungsmethode für saure und alkalische Phosphatasen. [A spectrophotometric method for estimation of acid and alkaline phosphatases.] *Helv. chim. Acta*, 1953, 36, 900-906. [Dept. Physiol. Chem., Univ. Wisconsin, Madison.] English summary.

The substrate used is *o*-carboxyphenyl phosphate and its hydrolysis is followed by measuring the increase in extinction at 298 m μ .—H. G. Bray.

Miscellaneous

125

- TERRIER, J. Le dosage indirect de l'eau dans les produits sucrés tels que le miel, la confiture, le glucose industriel, les extraits concentrés de fruits et la purée de tomate. [Indirect estimation of water in sugared products such as honey, jam, industrial glucose, concentrated fruit juices and tomato purée.] *Mitt. Geb. Lebensmittel. Hyg.*, 1953, 44, 302-307. [Lab. Cantonal, Geneva.] German and English summaries.

An azeotropic method with ethanol.

H. G. Bray.

126

- MILLER, R. A. and ELLIS, R. W. B. Tests for the adulteration of human milk. *Arch. Dis. Childhood*, 1953, 28, 161-169. [Royal Hosp. Sick Child., Edinburgh.]

127

- CHENEVAL, G. Méthode d'analyse des laits barattés et coagulés. [Method of analysing churned and curdled milks.] *Lait*, 1953, 33, 265-275. [Stat. Agronom., Nantes.]

The whole sample is worked through a fine sieve and transferred to a 350-ml. flask, the original container having been weighed before and after emptying. The contents of the flask are titrated with *N* NaOH, using phenolphthalein as indicator, and an excess of 0.5 ml. is added. The whole mixture is transferred to a separating funnel and shaken with a mixture of ether, ammonia sp. gr. 0.9212, 95 per cent. ethanol and water (275 : 8 : 200 : 45), 2.2 volumes of this mixture being used for each volume of milk plus water and *N* NaOH added. The ether-ammonia phase is separated from the aqueous phase and details are given for estimating fat in the former and total N, lactose and ash, corrected for K₂Cr₂O₇ present as preservative, in the latter.—W. Godden.

128

- HISZPAŃSKA, C., SĘŻEWSKA, L. and GOŁOŃSKA, C. Badania chemiczne i ocena preparatów odżywczych rynku krajowego. [Chemical investigation and estimation of the nutritive value of foods prepared for Polish infants and convalescents.] *Rocz. Państwowego Zakł. Hig.*, 1953, No. 2, 157-172. [Zakł. Badania Żywności, Warsaw.] Russian and English summaries.

129

- CROUSE, R. H. and LEFFLER, I. D. Detection of horse meat in meat products by a modified Paschke method. *Food Res.*, 1953, 18, 253-260. [Armour Res. Found., Chicago, Ill.]

N.A. and R., January 1954

130

- KUMANOWSKI, W. Oznaczanie zawartości azotynów w mięsie peklowanym metodą Griessa oraz metodą Auerbacha i Riessa. [Estimation of nitrates in salt meat by the Griess and Auerbach and Riess methods.] *Rocz. Państwowego Zakł. Hig.*, 1953, No. 2, 209-212. [Stacji Sanit.-Epidemiol., Radom.] Russian and French summaries.

131

- OXFORD, A. E. A colorimetric method, based on metallic complex formation, for the detection of aureomycin in presence of amino-acids and proteins. *Nature*, 1953, 172, 395-396. [Rowett Res. Inst., Bucksburn, Aberdeenshire.]

Aureomycin and amino-acids form stable complexes with certain metallic cations. The affinity of aureomycin for Ca^{++} and Co^{++} is great enough to provide the basis for the method described, which is valid when amino-acids are present. Ca is the metal chosen. The yellow complex is extracted from the reaction mixture by *n*-butanol.

H. G. Bray.

132

- ANDERSON, J. R. A. and MARTIN, E. C. The chromatographic examination of permissible food dyes. *Anal. chim. Acta*, 1953, 8, 530-537. [N.S.W. Univ. Technol., Sydney.] French and German summaries.

133

- SIEDLECKA, J. and GILEWSKA, C. Badania nad identyfikacją sztucznych barwników żywnościowych. [Identification of edible artificial colouring materials.] *Rocz. Państwowego Zakł. Hig.*, 1953, No. 1, 81-97. [Zakł. Badania Żywności, Warsaw.] Russian and French summaries.

134

- PETERS, J. H. and GUTMANN, H. R. Micromethod for measurement of carbon-14-labeled material. *Anal. Chem.*, 1953, 25, 987-988. [Radioisotope Unit, Veterans Admin. Hosp., Minneapolis, Minn.]

A modification of the method of Lindenbaum *et al.* (*Anal. Chem.*, 1948, 20, 1120), applicable to samples containing 0.5 to 3.0 mg. C, is described.

H. G. Bray.

MICROBIOLOGICAL

135

- UNDERKOFER, L. A., KITTS, W. D. and SMITH, R. L. Soluble cellulose derivatives as substrate for ruminal microorganisms. *Arch. Biochem. Biophys.*, 1953, 44, 492-493. [Iowa Agric. Exp. Stat., State Coll., Ames.]

Cellulose in which 70 per cent. of the anhydro-glucose units had been replaced by the Na salts of carboxymethylcellulose to render the whole molecule soluble was used as substrate to isolate rumen bacteria. Incorporated in a nutrient agar it gives a clear medium which makes it easy to identify and pick off colonies. Fermentation of this substrate by rumen bacteria produces volatile fatty acids, and the addition of toluene allows glucose to accumulate.—A. T. Phillipson.

136

- SUGDEN, B. The cultivation and metabolism of oligotrich protozoa from the sheep's rumen. *J. Gen. Microbiol.*, 1953, 9, 44-53. [Rowett Res. Inst., Bucksburn, Aberdeenshire.]

A method of separating large oligotrich protozoa

from rumen contents is described. *Metadinium medium* and a species of *Entodinium* were studied up to 12 days, the longest time of survival. Powdered cottonwool, 50 mg. daily, as sole carbohydrate substrate allowed survival up to 5 days, but the addition of 50 mg. powdered hay daily allowed survival up to 12 days. One-half to two-thirds of the cellulose supplied disappeared in 2 to 4 days. No organic nitrogen was supplied in the media when cottonwool alone was used, so that cultures of cellulolytic bacteria were unlikely to develop, and it is suggested that disappearance was too rapid to be accounted for by bacteria.

The addition of streptomycin, 560 mg. per ml., to cultures removed all bacteria, as was shown by cultural tests, and under these conditions protozoa died off more rapidly, and it is finally concluded that symbiotic cellulolytic bacteria were essential for survival after stored polysaccharide of the protozoa was exhausted. Streptomycin was not toxic to protozoa, for 2 cultures in which streptomycin-resistant strains of bacteria developed lived for 12 days.—A. T. Phillipson.

CLINICAL AND EXPERIMENTAL

- 137
BROWN, I. W. **Photographic method for enumeration of Ashby and total red cell counts.** *J. Lab. Clin. Med.*, 1953, **41**, 796-801. [Dept. Surg., Sch. Med., Duke Univ., Durham, N.C.]

Simple photomicrographic and projection devices are described. No additional error is introduced by counting free cells from photographs.

H. G. Bray.

- 138
BRADY, L. W., COOPER, D. Y., COLODZIN, M., McCLENATHAN, J. E., KING, E. R. and WILLIAMS, R. **Blood volume studies in normal humans.** *Surg. Gynecol. Obstet.*, 1953, **97**, 25-32. [Radioisotope Lab., U.S. Naval Hosp., Bethesda, Md.]

The subjects were healthy volunteers or patients awaiting elective surgery. Human serum albumin labelled with ^{131}I was used on 2 groups each of 20 subjects and blood volume was estimated from a single 10 min. sample with corrected haematocrit or from samples taken 10, 20 and 30 min. after injection to give a disappearance curve of ^{131}I extrapolated to a zero time.

The 3-sample method gave the more consistent results, which were significantly lower than those obtained from a single sample. The statistical significance of the difference for total blood volume was doubtful, but the view is expressed that it was genuine and that error arises from the haematocrit even when corrected.

Two estimations in rapid succession were made by the 3-sample method on 7 subjects with ^{131}I -labelled serum albumin and on 12 with Evans Blue. Reproducibility was good with both methods, the ^{131}I method being the better.

Finally, simultaneous estimations by the 3-sample method were made in 25 subjects of plasma volume with Evans Blue and with ^{131}I -labelled serum albumin and of red cell mass with ^{32}P -labelled red cells.

The Evans Blue method gave the highest values for plasma volume and total blood volume, and the ^{32}P method the lowest; the ^{131}I method was intermediate. The results are discussed, and it is concluded that the most accurate method of estimating total blood volume is by independent estimations of red cell mass with ^{32}P and of plasma volume with ^{131}I , avoiding the use of the haematocrit. Further studies, including estimation of red cell mass with ^{51}Cr , are in progress.—W. M. Deans.

- 139
SCHWAB, M. **Zur Methodik der Plasmavolumenbestimmung mit T-1824 ("Evans Blau").** [Technique of estimation of plasma volume with T 1824, Evans Blue.] *Arch. exp. Pathol.*

Pharmakol., 1953, **218**, 251-261. [Med. Klin., Univ. Göttingen.]

To compare the method of Gibson and Evans (Title 1914, Vol. 7) with that of Crooke and Morris (*J. Physiol.*, 1942, **101**, 217), estimations of plasma volume were made on 14 healthy subjects and on 9 patients with cardiac insufficiency. For unclouded and non-lipaemic plasmas the error in the direct photometric estimation by the method of Gibson and Evans was about half as great as that by the method of Crooke and Morris. In turbid and lipaemic plasmas, however, the direct photometric estimation of the concentration of Evans Blue is not possible, and then the method of Crooke and Morris can be used with advantage.

M. B. Richards.

- 140
TESHIMA, K., YAMADA, S., NAKAJIMA, Y., KAWATA, H. and SHIBATA, J. **On the estimation of blood volume by Evans Blue method.** *J. Osaka City Med. Center*, 1952, **1**, 174-179. [Dept. Surg., Med. Sch., Osaka City.] English summary.

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JENNINGS, F. W., LAUDER, I. M. and MULLIGAN, W. **Isotopic methods in blood volume determinations on domestic animals.** *J. Physiol.*, 1953, **121**, 53P-54P. [Vet. Sch., Univ. Glasgow.]

- 142
LAST, J. H., McDONALD, G. O., JONES, R. A. and BOND, E. E. **Failure to account quantitatively for infused inulin in human subjects.** *J. Lab. Clin. Med.*, 1953, **41**, 690-696. [Dept. Biochem., Northwestern Univ. Med. Sch., Chicago, Ill.]

Comments relative to the measurement of extracellular fluid volume.

- 143
ARONS, W. L., VANDERLINDE, R. J. and SOLOMON, A. K. **The simultaneous measurement of exchangeable sodium and potassium spaces in man.** *J. Clin. Endocrinol.*, 1953, **13**, 840-841. *Proc.* [Dept. Med., Harvard Med. Sch., Boston, Mass.]

- 144
BEHNKE, A. R., OSSERMAN, E. F. and WELHAM, W. C. **Lean body mass. Its clinical significance and estimation from excess fat and total body water determinations.** *Arch. Int. Med.*, 1953, **91**, 585-601. [Naval Tech. Unit (Med.), Heidelberg, Germany.]

A documented review.

145

- HARMON, F. L. **Reliability of metabolism measurements by the closed circuit method.** *J. Appl. Physiol.*, 1953, **5**, 773-778. [Dept. Psychol., Univ. St. Louis, Mo.]

This is a statistical analysis of 348 ten-min. records of human metabolic rate made on a standard clinical apparatus.—S. D. Morrison.

146

- KARVONEN, M. J. and NIEMI, M. **Perusaineen-vaihduun määrittämisen luotettavuus ja eräitä siihen vaikuttavia tekijöitä.** [The reliability of the estimation of the basal metabolic rate and the effect of various factors.] *Eri-painos Aikakausk.*, 1952, **4**, 265-269. English summary.

In duplicate estimations of B.M.R. on 100 subjects with Krogh's spirometer the error between duplicates was 4.4 per cent., the mean of all values being 105 ± 19 per cent. Seasonal variation and the errors introduced by cardiac decompensation and pulmonary insufficiency are discussed. (From summary.)—S. D. Morrison.

147

- KARVONEN, M. J. and NIEMI, M. **The accuracy of basal metabolism determination in the clinical laboratory.** *Scand. J. Clin. Lab. Invest.*, 1952, **4**, 112-114. [Dept. Physiol., Inst. Occupat. Health, Helsinki.]

See above Abst.

148

- BURSTALL, P. A., COX, E. V., ROBSON, J. G., ROSS, D. C., SCHOFIELD, B. and UNGLEY, C. C. **The preparation of pyloric gastric pouches in pigs as a source of Castle's intrinsic factor.** *J. Physiol.*, 1953, **121**, 3P-5P. [Dept. Anaesthetics, King's Coll., Newcastle upon Tyne.]

149

- HARKNESS, J. and DURANT, J. A. **Tubeless gastric analysis.** *J. Clin. Pathol.*, 1953, **6**, 178-182. [Biochem. Dept., Central Lab., Portsmouth.]

The preparation of the quininium resin indicator used is described. This is administered orally and subsequent urine samples are analysed for quinine in terms of its ultraviolet fluorescence. Errors involved are considered. The amount of free HCl cannot be estimated. The main use of the method is as a screening test in the investigation of achlorhydria.—H. G. Bray.

150

- BECKER, F. P. and MASLON, M. **Evaluation of tubeless gastric analysis: report of 90 determinations by intubation and tubeless methods**

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made simultaneously. *New Engl. J. Med.*, 1953, **249**, 68-69. [Warren County Bacteriol. Lab., Glens Falls, N.Y.]

Ninety estimations of free gastric HCl were made on 88 patients using simultaneously the tubeless (quinine resin) and the intubation technique. The results obtained by the 2 methods were in good agreement. No quantitative correlation was observed between quinine excretion and acid value, but the tubeless technique is recommended for routine qualitative estimations.—H. G. Bray.

151

- ROWLANDS, E. N., HONOUR, A. J., EDWARDS, D. A. W., and CORBETT, B. D. **Metal-capsule optical manometer for measuring pressure in the human gut with an open-ended tube.** *Clin. Sci.*, 1953, **12**, 299-306. [Dept. Clin. Res., University Coll. Hosp. Med. Sch., London.]

The use of 1 mm. polythene tubing to record pressure changes in the duodenum is described. The tubing was used either with an open end which was dilated or with a small balloon attached to the end. With both methods the system is air-filled and is attached to a thin-walled brass capsule, the curvature of which alters with the pressure of air in the polythene tubing. A mirror is fixed eccentrically to the capsule and its movements are recorded optically. This method has proved a great deal more sensitive than conventional methods of recording changes of intraluminal pressure in the intestine.

A. T. Phillipson.

152

- WILSON, T. H. and WISEMAN, G. **A method for studying intestinal metabolism and absorption.** *J. Physiol.*, 1953, **121**, 45P. [Dept. Biochem., Univ. Sheffield.]

153

- SMYTH, D. H. and WHALER, B. C. **Apparatus for the *in vitro* study of intestinal absorption.** *J. Physiol.*, 1953, **121**, 2P-3P. [Dept. Physiol., Univ. Sheffield.]

154

- SPENCER, H., LEWIN, I. and LASZLO, D. **A simple test to study calcium metabolism in endocrine disorders.** *J. Clin. Endocrinol.*, 1953, **13**, 861. *Proc.* [Div. Neoplastic Dis., Montefiore Hosp., New York.]

155

- COHEN, B. S. **Bone marrow aspiration in the monkey (*Macacus rhesus*).** *Blood, J. Hematol.*, 1953, **8**, 661-663. [Chem. Corps Med. Labs., Army Chem. Centre, Md.]

156

- SISSONS, H. A. **Experimental determination of rate of longitudinal bone growth.** *J. Anat.*, 1953, **87**, 228-236. [Inst. Orthopaed., Univ. London.]

157

- HOLMAN, J. C. M. **Preparation of iodized salt for goitre prophylaxis.** *Bull. World Health Organiz.*, 1953, **9**, 231-239. [Chilean Iodine Educat. Bur., London.] French summary.

The methods for iodising finely ground salt are not suitable for treating the coarsely crystalline product obtained by solar evaporation in open pans. Equipment is described by which 5 tons daily of coarse salt may be iodised by a mixture of KI or KIO₃ with CaCO₃. With a larger form output could be 25 tons daily. If the salt is to be stored in a humid environment and if KI has been used small quantities of Na₂CO₃, starch, Na thiosulphate or Ca stearate may be added for stabilising, but with KIO₃ this is unnecessary.

B. W. Simpson.

158

- BEAKLEY, W. R. and FINDLAY, J. D. **A climatic chamber for large animals.** *J. Physiol.*, 1953, **121**, 40P. [Hannah Dairy Res. Inst., Kirkhill, Ayr.]

159

- WILSON-JONES, G., GROENEWALD, J. W. and QUINLAN, J. B. **The Onderstepoort small animal colony.** *Onderstepoort J. Vet. Sci.*, 1953, **26**, 149-172. [Onderstepoort Lab.]

Methods of feeding, breeding and housing mice, rats, guineapigs, rabbits, ferrets and hamsters are described in detail and illustrated.—P. C. Jowsey.

160

- FERGUSON, I. D. and RAMSAY, A. G. **An automatic refilling water container for laboratory animals.** *J. Physiol.*, 1953, **121**, 37P-39P. [Inst. Physiol., Univ. Glasgow.]

161

- IRVIN, H. M. and WISEMAN, H. G. **The possible use of plant pigments as a marker in digestion trial studies.** *J. Dairy Sci.*, 1953, **36**, 582-583. *Proc.* [Dairy Dept., Univ. Maryland, College Park.]

162

- IRVIN, H. M., WISEMAN, H. G., SHAW, J. C. and MOORE, L. A. **The role of plant pigments in digestion trial studies.** *J. Animal Sci.*, 1953, **12**, 541-551. [Dairy Dept., Univ. Maryland, College Park.]

Samples of hay and the faeces of two cows obtained in a digestibility trial were extracted

with 80 per cent. ethanol. The pigments were obtained from these extracts by extraction with light petroleum after dilution to varying concentration with 4 per cent. NaCl. The absorption curves of the pigments obtained were compared in a Beckman spectrophotometer. Chlorophyll, though definitely changed, may remain identifiable in the digestive tract in sufficient quantity to act as a marker. Whilst composite curves of the total hay and total faeces pigments are practically identical and show an average recovery of 97.4 per cent. of the pigments in the faeces and therefore tend to support the basic theory of the chromogen marker technique, it is clear from the results that no one of the pigments alone can be relied upon as a digestion trial marker.—D. M. Walker.

163

- HARDISON, W. A., REID, J. T. and MARTIN, C. M. **A procedure for measuring pasture herbage consumption.** *J. Dairy Sci.*, 1953, **36**, 583. *Proc.* [Cornell Univ., Ithaca, N.Y.]

164

- KANE, E. A., JACOBSON, W. C., ELY, R. E. and MOORE, L. A. **The estimation of the dry matter consumption of grazing animals by ratio techniques.** *J. Dairy Sci.*, 1953, **36**, 582, *Proc.*; 637-644. [Bur. Dairy Indust., Agric. Res. Admin., U.S. Dept. Agric., Washington, D.C.]

Estimations of the digestibility of forages by chromium oxide ratios, by plant pigment formula and by indigestible protein formula were equally accurate when a total collection technique was used. The comparison was made between cattle on a cocksfoot pasture and similar animals stalled on cuttings from the same pasture. The simultaneous use of an internal and an external digestibility indicator was satisfactory for the measurement of both the digestibility and the dry matter consumption of forage eaten by grazing animals (see Abst. 5136, Vol. 23).—T. D. Bell.

165

- WHITEMAN, J. V. and WHATLEY, J. A. **An evaluation of some swine carcass measurements.** *J. Animal Sci.*, 1953, **12**, 591-596. [Dept. Animal Husb., Oklahoma Agric. Exp. Stat., Stillwater.]

Measurements of sp. gr., thickness of back fat, area of lean in eye muscle and ham, both by product of length and width and by planimeter, and the percentages of chilled carcass weight of loin, ham and loin and ham together were made on the carcasses of 203 pigs, mainly Duroc and Duroc crosses. Estimation of eye muscle area from the product of length and width was simpler than by planimeter, and almost as accurate. This, com-

bined with sp. gr., was a useful way of predicting leanness of carcase. Average thickness of back fat also gave a good indication of the percentage lean cuts in the carcase.—T. D. Bell.

166

- RAUCH, W. Mathematisch-statistische Untersuchungen über die Legeleistung von Hühnern. [Mathematical-statistical study of the

performance of hens.] *Arch. Geflügelk.*, 1953, 17, 230–237. [Bundesforschungsanst. Kleintierzucht, Celle.] English summary.

Results for the year 1951 to 1952 for 175 hens of 25 different breeds or strains are used to illustrate a method for calculating or estimating from a curve the accuracy with which mean egg weight can be ascertained by sampling at regular intervals in different ways.—W. M. Deans.

See also Absts. 645, 1105, 1327, 1365, 1373.

COOKING, STERILISATION AND PRESERVATION OF FOOD

167

- CATEL, W., PENDL, J. and SCHIFF, O. Eine neue Methode der Haltbarmachung von roher Frauenmilch. [A new method for preserving raw human milk.] *Deutsch. med. Wochenschr.*, 1953, 78, 1137–1140. [Landeskinderheilstätte Mammolshöhe.]

The disadvantages of preserving human milk by heating are briefly recalled. A satisfactory powder, easily transportable and readily reconstituted with distilled water, may be prepared by freeze-drying [no details of the process are given].

Comparative tests on a batch of fresh human milk divided into 4 portions, untreated, heated in a water-bath at 100° C. for 10 sec., freeze-dried and reconstituted with distilled water, and the same heated at 100° C. for 10 sec., showed that reconstituted freeze-dried milk retained the power of the fresh milk to inhibit the growth of the diphtheria bacillus and *Streptococcus haemolyticus*. A subsidiary experiment indicated that the antibacterial properties are associated with the milk fat. Freeze-drying did not affect the riboflavin, vitamin B₁₂ or vitamin C content, but carotene and vitamin A were reduced more by freeze-drying than by heating. Freeze-dried milk, unlike heated milk, retained the catalase activity and most of the lipase activity, and, for some unknown reason, its amylase activity was twice that of fresh milk.

A later paper will deal with the stability of freeze-dried human milk and details of the organisation of a milk bank based on its use.

W. M. Deans.

168

- PATTON, S. and FLIPSE, R. J. Studies of heated milk. 5. The reaction of lactose with milk protein as shown by lactose-1-C¹⁴. *J. Dairy Sci.*, 1953, 36, 766–771. [Pennsylvania Agric. Exp. Stat., State College.]

169

- PATTON, S. and JOSEPHSON, D. V. Methionine—origin of sunlight flavor in milk. *Science*, 1953, 118, 211. [Pennsylvania Agric. Exp. Stat., State College.]

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Milk containing added methionine at rates of 0, 4, 20 or 50 mg. per qt. was exposed to sunlight in ordinary glass milk bottles for 1 hr. The "sunlight" flavours developed were rated slight, strong, very strong and very strong plus, respectively. A control sample containing 50 mg. methionine per qt. milk developed no flavour when stored in a refrigerator. Addition of riboflavin, 1.5 mg. per qt., to a distilled water solution of methionine, 20 mg. per qt., produced a "sunlight" flavour even in the refrigerated control. Cystine and cysteine added to milk exposed to sunlight had no effect on flavour. The flavour appeared to result from photolysis of methionine.

P. C. Jowsey.

170

- SHIPSTEAD, H. and TARASSUK, N. P. Dehydrated foods. Chemical changes in dehydrated milk during storage. *J. Agric. Food Chem.*, 1953, 1, 613–616. [Dept. Dairy Indust., Univ. California, Davis.]

171

- DE, S. and RAY, S. C. Studies on the indigenous method of *khoa*-making. 2. The effect of abnormalities in milk supply on *khoa* production with a note on shelf-life of *khoa*. *Indian J. Dairy Sci.*, 1953, 6, 47–60. [Indian Dairy Res. Inst., Bangalore.]

172

- GREENBANK, G. R. and HUFNAGEL, C. F. The effect of the fat content of the milk on the keeping quality of the dried product. *J. Dairy Sci.*, 1953, 36, 566. *Proc.* [Bur. Dairy Indust., U.S. Dept. Agric.]

173

- OZAWA, Y., KENBÔ, H. and NAITÔ, K. [Studies on the oxidation mechanism in emulsified fat or oil. 1. On the influence of milk constituents upon the oxidation in margarine. 2. On the influence of milk- and egg-constituents on the catalytic oxidation under the existence of copper ions.] *Bull. Nat. Inst. Agric. Sci.*,

Chiba [G], 1953, No. 6, 67-74; 75-81. In Japanese: English summary.

1. Skimmed milk, buttermilk and Na caseinate were found to be most effective anti-oxidants for margarine. When casein and albumin were removed from the skimmed milk its anti-oxidising activity was greatly reduced.

2. Colloidal protein, e.g., egg yolk or egg white, also prevented catalytic oxidation of fat when a small amount of Cu sulphate was added. The mechanism of the protective action is discussed. (From summary.) J. S. Thomson.

174

WHITE, P. L., HEGSTED, D. M. and MAYER, J. **Two complex salts of choline and copper chloride and their activity as catalysts of fat oxidation.** *J. Amer. Chem. Soc.*, 1953, **75**, 2352-2354. [Dept. Nutrit., Harvard Sch. Pub. Health, Boston, Mass.]

When choline chloride and copper nitrate are dissolved separately in 95 per cent. ethanol and the solutions are mixed a yellow and a red compound are formed. The former can be extracted by boiling ethanol, from which bright yellow needles are deposited on cooling. The yellow has the formula $((CH_3)_3NC_2H_4OH)_2CuCl_4$ and the red $((CH_3)_3NC_2H_4OH)CuCl_3$. Both substances are hygroscopic. In the absence of moisture they are superior to $CuCl_2$ and $CuSO_4$ as catalysts in the oxidation of maize oil. They are probably responsible for the rapid development of rancidity in experimental diets rich in copper salts and choline.—W. Godden.

175

HARTMAN, L. **Non-toxic stabilizers for animal fats.** *J. Sci. Food Agric.*, 1953, **4**, 430-433. [Fats Res. Lab., D.S.I.R., Wellington, N.Z.]

Data are given on the stabilising effect of mixed glyceryl esters of citric acid and fatty acids on beef and mutton fats and on lard, and their use is suggested as a convenient method of incorporating citric acid in fats. The widespread approval granted by the laws of Britain and western European countries to the use of citric acid and the facts that such esters form true solutions with fats and are effective stabilisers favour their use in this connection.—D. Harvey.

176

WANG, H., ANDREWS, F., RASCH, E., DOTY, D. M. and KRAYBILL, H. R. **A histological and histochemical study of beef dehydration. 1. Rate of dehydration and structural changes in raw and cooked meat.** *Food Res.*, 1953, **18**, 351-359. [American Meat Inst. Found., Univ. Chicago, Ill.]

The results of preliminary histological and histochemical studies on raw and pre-cooked strips of beef muscle (*Biceps femoris*) dehydrated at 70° C. in a convection oven or at 65° C. in a vacuum oven for periods from $\frac{1}{2}$ to 24 hr. are reported.

Pre-cooked meat lost moisture more rapidly and completely than raw meat. Strips cut perpendicular to the muscle fibres lost more moisture than strips cut parallel to them. With raw meat, moisture loss and decrease of muscle fibre diameter ran parallel. Longitudinal striations disappeared and cross striations became less distinct. The only chemical change established was a movement of potassium to the periphery of the fibres.

The strips did not rehydrate satisfactorily when held in water at 70° C. for 15 min.—W. M. Deans.

177

SIEMERS, L. L. and HANNING, F. **A study of certain factors influencing the juiciness of meat.** *Food Res.*, 1953, **18**, 113-120. [Sch. Home Econ., Univ. Wisconsin.]

Methods of small scale cooking and of estimating losses in the process were evolved. Blended samples of lean meat and kidney fat were mixed, with the lean forming 100, 75 and 50 per cent. of the mixtures, and 5-g. samples were treated in a manner simulating braising at temperatures of 70°, 80°, 90° and 98° C. for 5, 10, 20 and 30 min. The complete data are recorded elsewhere (Siemers, *Thesis*, Univ. Wisconsin, 1952); only illustrative curves and summary tables showing statistical findings are reproduced here. Loss of the water phase from blended samples decreased with increasing percentage of fat, and juice loss increased with time of cooking.

In a second experiment rectangular blocks of beef muscle as such or covered with suet were cooked to represent simmering for 10, 15 or 25 min. and losses and effect on palatability were compared. The rate of heat transfer in similar samples was also measured. Increase of length of treatment increased cooking loss, but covering with suet lessened it. The heat transfer rate was less in covered than in uncovered samples and the smaller loss was probably the result of this reduced degree of cooking. Palatability decreased significantly with increasing juice loss.

More detailed study of suet alone showed that the presence in it of connective tissue strands decreased the heat penetration rate compared with that in similar samples which had been minced or from which such tissue had been removed.—D. Harvey.

178

SWANSON, M. H. and SLOAN, H. J. **Some protein changes in stored frozen poultry.** *Poultry Sci.*,

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1953, **32**, 643-649. [Dept. Poultry Husb., Univ. Minnesota, St. Paul.]

Ten New Hampshire fowls were killed at 11 to 12 months of age and after dressing were stored at -5°F. for over 40 weeks. Samples of breast and leg meat were taken from each bird at 8-week intervals for the estimation of dry matter, total N, water-soluble N, soluble α -amino-N and soluble N.P.N. Breast muscle had a higher N content than leg muscle throughout and no change in the total N content of either was found in this trial. Water-soluble N increased 13.5 per cent. in leg meat and 14.3 per cent. in breast meat and N.P.N. increased 22.4 per cent. and 27.9 per cent., respectively. These results were taken to indicate proteolysis during storage. The free α -amino-N, however, decreased during storage, indicating that N catabolism continued beyond the amino stage.

M. J. Head.

179

NASH, A. M., MAYFIELD, H. L. and ODLAND, L. M. **Physical, chemical and cooking qualities of eggs as affected by five methods of home preservation.** *Poultry Sci.*, 1953, **32**, 275-284. [Dept. Home Econ., Agric. Exp. Stat., Montana State Coll., Bozeman.]

Clean eggs were treated daily as brought in from the farm. The methods of preservation were (1) in waterglass, 1 part sodium silicate to 9 parts water, (2) by freezing, one tablespoonful of sucrose being mixed with each cup of liquid whole egg before freezing and storage in pint cartons at -10°F. , (3) by a thin coating of creamy emulsion preservative applied to the egg, (4) by oiling, the eggs being dipped at room temperature into mineral oil of Saybolt universal viscosity of 50 to 60 sec. at 100°F. and then drained for 1 hr. and placed in cartons, (5) by plastic coating (*cf.* Yushok and Romanoff, Title 1829, Vol. 19) applied by hand, (6) no treatment. All eggs were stored in the dark at 50° to 60°F. and tested before preserving and after 3 and 6 months' storage. The quality of the eggs was judged on the basis of loss in weight during storage, height, width, index and pH of albumin; colour and height of yolk; palatability of cooked yolk and suitability for poaching and for making baked custards and sponge cakes. The ranking was then fresh, 3, 1, 4, 5, 6. The frozen eggs, 2, could not be included in all the tests because they were broken in storage, but in tests in which comparison was possible freezing ranked third.—M. J. Head.

180

BOTHMA, F. and GREUP, D. H. De houdbaarheid van brood. [**Keeping quality of bread.**] Repr. from *Conserva*, 1952-53, **1**, 406-413. [Centraal Inst. Voedingsonderzoek T.N.O., Wageningen.]

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Keeping quality of bread is of little moment in everyday housekeeping and even less for wheat than for rye bread. But it is of great importance for expeditions and in time of emergency. Baking is not always sufficient to sterilise; for instance, the spores of the bacillus that causes rosy bread are not killed. Reduction of pH by sour-dough or addition of lactic or acetic acid helps, but acetic acid and acetates are at present prohibited. Cut bread, especially rye bread, presents a special problem. It may be sterilised by ultraviolet light, or packed and sterilised in the oven. Canned bread becomes increasingly popular in America. Protection from insect, mite and rodent attack is a simple question of suitable packing and storage, or both.

Chemical changes and development of rancidity or bitterness in oat products, and loss of aroma, off-flavours and browning in canned bread can to some extent be avoided by storage at low temperatures. Physical changes such as loss and absorption of water and "staling" are not easily controlled. Staling appears to be due to changes in the starch molecule. It may be reduced by the use of shortening, malt and, more recently, enzymes from fungi or by baking in two stages, with storage in the refrigerator in the interval. Polyoxyethylene stearate is forbidden in the Netherlands.

I. Leitch.

181

GORDON, A. L., JENNESS, R. and GEDDES, W. F. **Further studies of the heat-labile loaf volume depressant of milk serum proteins.** *Cereal Chem.*, 1953, **30**, 213-221. [Minnesota Agric. Exp. Stat., St. Paul.]

A study of the fractions of serum milk proteins indicated that the constituent responsible for change in loaf volume was present mainly in the lactoglobulin fraction. Euglobulin and pseudoglobulin prepared from colostrum, which comprise 40 per cent. of this fraction, have been proved to be without effect on loaf volume (Abst. 1396, Vol. 23). The active constituent, still unidentified, is therefore in the remaining 60 per cent. The depression of loaf volume was produced by only 125 mg. protein per 100 g. flour. Further studies are in progress.—D. Harvey.

182

FRAZER, A. C., MEREDITH, P. and SAMMONS, H. G. **Studies on the effects of chlorine dioxide on gluten.** *Biochem. J.*, 1953, **54**, xxxvii. [Dept. Pharmacol., Univ. Birmingham.]

183

LINDBERG, J. E. Versuch über die Wärmehandlung von Weizen. [**Heat treatment of wheat.**] *Getreide und Mehl*, 1953, **3**, 17-22. [Svalöf.]

Varieties of wheat from 2 seasons' crops were examined. Samples before or after partial air drying were heated in a rotating cylinder in a closed container, in such a way as to avoid further loss of moisture, at temperatures from 35° to 65° C. for a constant time. The effects on the germinating power of the grain and the baking quality of the flour, with or without addition of bromate, were examined.

Germinating power remained unchanged with rise in pre-heating temperature until a critical temperature was reached, when a further rise of 2° to 5° C. caused a sudden fall to zero. The riper the wheat, the higher the critical temperature. In the baking trials leavening capacity and bread weight were, as a rule, unaffected by pre-heating temperature, but bread volume, form, porosity and appearance were much changed. The lower temperatures had little effect on bread volume, but higher temperatures reduced it. If the flour was treated with bromate before baking the effect occurred at lower original temperatures, and with moist wheat this was noticed at the lowest temperature used, 35° C. Changes in volume, shape and porosity were equally dependent on the moisture content of the wheat. Without addition of bromate to the flour critical temperatures for such changes were 50° C. with 25 per cent. moisture, 55° C. with 20 per cent. and 65° C. with 15 per cent. The critical temperatures were 5° to 10° C. lower if bromate was added to the flour.

W. Godden.

184

ALDRED, F. L. (Ed.) **Recent research on drying and storage of rough rice.** *Texas Agric. Exp. Stat. S. Cooperative Ser. Bull.* No. 29, January 1953, pp. 29.

185

RENNER, R., CLANDININ, D. R., MORRISON, A. B. and ROBBLEE, A. R. **The effects of processing temperatures on the amino acid content of sunflower seed oil meal.** *J. Nutrition*, 1953, 50, 487-490. [Poultry Div., Univ. Alberta, Edmonton.]

Four sunflower seed meals were examined. The temperatures in the cooker and processor were 240°, 260°; 200°, 220°; 220°, 240° F. for 3 of them. The fourth meal was prepared by autoclaving the second at 15 lb. steam pressure for 4 hr. The essential amino-acids were liberated either by acid hydrolysis (alkaline for tryptophan) or by enzymic hydrolysis. Less lysine, arginine and tryptophan were liberated by chemical hydrolysis from the first than from the second and third meals. Autoclaving the second meal depressed the liberation of these amino-acids. No relation existed between the liberation of essential amino-

acids by enzymic hydrolysis and the relative nutritive values previously reported by Morrison *et al.* (Abst. 5284, Vol. 23).—F. C. Aitken.

186

HOFFPAUIR, C. L. **Peanut composition, relation to processing and utilization.** *J. Agric. Food Chem.*, 1953, 1, 668-671. [S. Reg. Res. Lab., New Orleans, La.]

A review.

187

RICHERT, P. H. **Dehydrated food. Chemical aspects of dried fruits.** *J. Agric. Food Chem.*, 1953, 1, 610-612. [Coast Labs., Fresno, Calif.]

188

ANDERSON, E. E., ESSELEN, W. B. and FELLERS, C. R. **Noncaloric sweeteners in canned fruits.** *J. Amer. Dietetic Assoc.*, 1953, 29, 770-773. [Dept. Food Technol., Univ. Massachusetts, Amherst.]

Raspberries, cherries, blueberries, peaches, pears and rhubarb were canned in sucrose syrup or a solution of saccharin or Sucaryl sodium (cyclohexylsulphamate sodium) of equal sweetness, or water, stored at room temperature and examined by a tasting panel at intervals up to 1 year. All packs had ascorbic acid added to prevent colour changes.

The differently sweetened products were judged almost equally acceptable. All were preferred to the unsweetened. It was found that pectin, sodium carboxymethylcellulose, or Krim-Kold, a seaweed extractive, could be added to saccharin and Sucaryl sodium packs to produce a syrup of viscosity equal to that of sucrose syrup. Since replacement of a 30° Brix sucrose syrup by saccharin or Sucaryl sodium solution reduced the soluble solids (carbohydrate) content and energy value by at least 50 per cent., it is considered that fruit canned with these sweeteners would appeal both to diabetic persons and to those wishing to reduce their weight.—W. M. Deans.

189

TANDON, G. L., PRUTHI, J. S. and LAL, G. **Varietal trials on canning of potatoes.** *Bull. Central Food Technol. Res. Inst. Mysore*, 1953, 2, 207-210. [Central Food Technol. Res. Inst., Mysore.]

190

HILBERT, G. E. **Processing trends and the nutritive value of foods.** *Proc. Nat. Food Nutrit. Inst.*, December 1952; *U.S. Dept. Agric.*,

N.A. and R., January 1954

Agric. Handbook No. 56, 86-92. [Bur. Agric. Indust. Chem., Agric. Res. Admin., U.S. Dept. Agric.]

191

MUKULA, J. Perunan varastomistappioista ja niiden ehkäisemisestä. [Storage losses of potatoes and their control.] *Valtion Maatalouskoetoiminnan Julkaisuja* No. 137, 1953, pp. 39. [Maatalouskoelaitoksen Kasvitaustiasasto, Tikkurila, Finland.] English summary.

Previous work is briefly reviewed. The work reported was done during the 2 seasons 1948 to 1949 and 1950 to 1951.

Losses by rotting were on the average 3 to 4 per cent. during winter storage, i.e., from harvest to April or May. If storage continued to July losses were approximately doubled. High relative humidity did not increase losses, but if the potatoes were wetted rotting occurred more readily, especially if the temperature was high. Fan ventilation of the storage bins decreased the losses. The chemicals Belvitan K, Fusarex, Dormatone, Ipno-germ, Reposine, Tuberite, Mana, Vana, Keim X and Agermine had no effect on loss by rotting.

Losses by sprouting amounted on the average to 10 per cent. by weight of the potatoes by the end of July in untreated samples. Fusarex, Belvitan K and Reposine inhibited sprouting over the same period. Total losses, by rotting and sprouting, in potatoes treated with chemicals increased on the average by 1.3 per cent. per month from 4 per cent. in January to 13 per cent. by the end of July. From harvest to May losses in untreated potatoes were about the same, but after that date losses increased by 7 per cent. per month and amounted to 30 per cent. by the end of July. (From summary.)—P. C. Jowsey.

192

MÜNCHOW, S. and QUENSTÄDT, J. Beitrag zur Klärung von Lebensmittelvergiftungen und zur Verwendbarkeit von Nickelkochkesseln. [Food poisoning and the use of nickel cooking vessels.] *Zentralbl. Bakteriol. Parasitenk.*, 1953, **159**, 362-371. [Bezirks Hyg. Inst., Chemnitz.]

An outbreak of food poisoning which affected about 250 persons in a hospital was associated with consumption of a goulash prepared and cooked in a nickel pan and re-heated after standing in the pan overnight. The sauce was acid and corrosion of the pan had occurred. There was also a considerable content of mixed bacteria.

The solubility of Ni in vinegar and acid sauces was investigated and considerable amounts of Ni were found in mixtures exposed to the metal for longer than 4 hr. The actual amounts of Ni were probably not poisonous but with prolonged keeping

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in the pans there was increased bacterial contamination by "unspecific" organisms. It is recommended that acid foods cooked in Ni pans should be removed from the pans if they must be kept for more than a few hours.—A. M. Copping.

193

ERIKSSON, S. Kofasaltets verkan som tillsatsmedel vid ensilering av vallfoder. [Effect of Kofasalt for ensiling pasture.] *Kgl. Lantbruksakad. Tidskr.*, 1953, **92**, 213-219. English summary.

Kofasalt is a mixture of 20 parts calcium formate and 3 parts sodium nitrite. As the silage ferments, the salt is supposed to liberate oxides of N which inhibit putrefaction of protein but not lactic acid fermentation. Two series of experiments are described in which 22 kg. alfalfa cut before or at budding stage were ensiled with 66 g. Kofasalt. Each series included duplicate lots ensiled fresh, 18 to 19 per cent. dry matter, wilted to about 25 per cent. dry matter and wilted to 32 to 33 per cent. dry matter.

Kofasalt improved the quality of the silage and reduced losses, much more in that from fresh alfalfa than from wilted; indeed, the effect of wilting exceeded that of the salt.—I. Leitch.

194

BRATZLER, J. W., COWAN, R. L. and SWIFT, R. W. Sodium metabisulfite as a preservative for grass silage. *J. Dairy Sci.*, 1953, **36**, 603. *Proc.* [Pennsylvania State Coll., State College.]

195

BARNETT, A. J. G. and DUNCAN, R. E. B. The determination of the volatile fatty acids formed during the fermentation of grass/water mixtures. *J. Agric. Sci.*, 1953, **43**, 260-264. [Div. Agric. Biochem., Dept. Biol. Chem., Univ. Aberdeen.]

A gas partition chromatographic technique (Abst. 77, Vol. 22) was used. Only acetic, propionic and butyric acids were detected in the slurries studied.—H. G. Bray.

196

HARSHBARGER, K. E., NEVENS, W. B. and TOUCHBERRY, R. W. A method for estimating the value of corn silage. *J. Dairy Sci.*, 1953, **36**, 583. *Proc.* [Univ. Illinois, Urbana.]

197

HERFORD, G. V. B. New developments in the control of insects infesting foodstuffs. *J. Roy. Sanit. Inst.*, 1953, **63**, 412-418. [Pest Infestation Lab., D.S.I.R.]

See also Absts. 72, 391, 538, 716, 1344.

2. CHEMICAL COMPOSITION OF FOODSTUFFS

(Except Vitamins, for which see Section 3.)

ENERGY VALUE, PROXIMATE PRINCIPLES AND INORGANIC CONSTITUENTS

GENERAL

198

MAŚIAKOWA, W., RUDOWSKA-KOPROWSKA, J., SZCZYGIEŁ, A. and JAKUBIEC, T. Próby zastosowania bomby kalorymetrycznej do masowej kontroli wartości energetycznej posiłków. [Experimental use of a bomb calorimeter in the routine examination of the energy value of meals.] *Rocz. Państwowego Zakł. Hig.*, 1953, 23-39. [Dział. Hig. Żywnienia, Warsaw.] Russian and English summaries.

Samples of meals (whole day's meals, dinners and kitchen and table waste) were analysed by the usual chemical methods and net and gross energy values were calculated. The meals were then burned in a bomb calorimeter. From comparison of the results obtained it is suggested that to obtain the gross energy value of meals of average composition it is necessary to subtract about 5 per cent. from the value obtained by bomb calorimeter. Where net values are to be estimated, 8 per cent. should be subtracted. (From summary.) J. S. Thomson.

199

PYKE, M. Chemicals in foodstuffs. *Practitioner*, 1953, 171, 166-172.

200

REVOREDO ALVA, B. O. Valoración del zinc en productos alimenticios. [Estimation of zinc in food products.] *An. Fac. Farm. Bioquím.*, Lima, 1951, 2, 234-238. [Lab. Bromatol., Univ. Nac. Mayor de San Marcos, Lima.]

Zn was estimated by the dithizone colorimetric method in 12 Peruvian foods. In products of vegetable origin the contents were, in mg. per kg.: rice 11.35, wheat flour 26.15, "quinua" (*Chenopodium quinoa*) 17.31, pea flour 25.75, French beans 26.56, lentils 28.16 and carrots 1.9. In foods of animal origin, the contents were, in mg. per kg. fresh product: flesh, brains and liver of cow 13.20, 16.85 and 31.13, respectively, pig flesh 17.91, and edible part of "choros" (a kind of cockle) 23.87.—M. B. Richards.

See also Abst. 1023.

FOODSTUFFS OF ANIMAL ORIGIN

Milk and Milk Products

201

PETERS, F. E. The chemical composition of New Hebridean human milk. *Brit. J. Nutrition*, 1953, 7, 208-211. [S. Pacific Commission, Noumea, New Caledonia.]

Milk was collected during a 4-hr. period from Melanesian women and data are presented for the fat, lactose, protein, ash, Ca and P in 51 samples. There was some evidence that the lactose and Ca contents of the Melanesian samples were less than in the Australian samples with which they were compared and that, with the long continuation of lactation by the Melanesian women, up to 24 months, there was a slight decline in non-fat constituents.—D. Harvey.

202

KUHN, R., GAUHE, A. and BAER, H. H. Über ein N-haltiges Tetrasaccharid aus Frauenmilch. [A nitrogen-containing tetrasaccharide from human milk.] *Chem. Ber.*, 1953, 86, 827-830. [Inst. Chem., Max-Planck-Inst. Med. Forsch., Heidelberg.]

One of the oligosaccharides detected in human milk by paper chromatography (Gauhe *et al.*, *J. Biol. Chem.*, 1953, in the press) was isolated by repeated chromatography on columns of carbon and Celite, eluted with mixtures of ethanol and water and finally crystallised from absolute alcohol. It was dextrorotatory and only slightly sweet and decomposed at 200° to 205° C. Analysis showed that it was a tetrasaccharide with the formula $C_{26}H_{45}O_{21}N$. On acid hydrolysis it gave glucosamine, galactose and glucose, and it contained 2 molecules of galactose and 1 of glucose. The name lacto-N-tetraose is proposed for it.

W. M. Deans.

203

ROSS, C. A. C. Hexosamine in human and cow's milk. *Brit. J. Nutrition*, 1953, 7, 259-262. [Dept. Infect. Dis., Univ. Glasgow.]

The amino-acid composition of hydrolysed protein from human and cow's milk was similar except for the frequent appearance of glucosamine in chromatograms of human milk. It was shown not to have originated in mucin liberated by tissue trauma during the use of the breast pump. Of 7 samples of human colostrum, only 2 showed a normal amount and 2 others a trace. It was not present in chromatograms from unhydrolysed material.—D. Harvey.

204

DE VUYST, A., IMBERECHTS, R. and VERVACK, W. Rapport entre la graisse et l'albumine du lait de vache. [Relationship between the fat and protein of cow's milk.] *Zootechnia*, 1953, 2,

N.A. and R., January 1954

137-146. [Centre Recherches Zootech., Univ. Louvain.] Spanish and English summaries.

A statistical analysis of data from 157 milk samples obtained from 15 white Belgian cows over 150 days in 1948 (*Agricultura*, 1948, No. 4) failed to establish any correlation between the percentage of fat and that of the total protein.

W. Godden.

205

BARRY, J. M. and ROWLAND, S. J. **Variations in the ionic and lactose concentrations of milk.** *Biochem. J.*, 1953, **54**, 575-578. [Nat. Inst. Res. Dairying, Univ. Reading.]

Lactose, Na, K and Cl were estimated in samples of milk from 38 cows in different stages of lactation. The results showed linear relationships between Na and Cl, Na and K and K and Cl with the very high correlation coefficients + 0.98, - 0.95 and - 0.97, respectively. Regression equations were calculated for each pair of ions. Analysis of serum from blood samples drawn at the time of milking suggested that the composition of all the milk samples studied could result from the mixing, in different proportions, of a milk similar to that produced in early lactation with a fluid differing only slightly in composition from blood serum.

W. Godden.

206

WASHBURN, R. G., HIBBS, J. W. and SAYRE, J. D. **Relation of mineral content of summer milk to mineral content of pasture herbage.** *Ohio Agric. Exp. Stat. Res. Circular* No. 13, April 1953, pp. 16. [Wooster, Ohio.]

Three groups each of 5, 6 or 7 Jersey cows were studied during 3 grazing seasons. Ash from milk and pasture samples was analysed spectrographically and the following elements were identified in both: Ag, Al, B, Ba, Ca, Cu, Cr, Fe, K, Mg, Mn, Mo, Na, P, Si, Sr, Ti and Zn. Sn was found in pasture ash only. Some elements were estimated quantitatively and the results are presented in graphs. No seasonal trends in the mineral content of milk was noted; some trends in the mineral content of pasture were indicated. No correlation between the mineral content of milk and that of pasture was established.—P. C. Jowsey.

207

HONER, C. J. and TUCKEY, S. L. **Chromatographic studies of reducing sugars, other than lactose, in raw and autoclaved milk.** *J. Dairy Sci.*, 1953, **36**, 559. *Proc.* [Univ. Illinois, Urbana.]

208

KING, J. O. L. **Some factors of veterinary interest affecting the composition of cows' milk.** *Vet. Rec.*, 1953, **65**, 463-466 (with discussion 466-467). [Fac. Vet. Sci., Univ. Liverpool.]

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209

NIELSEN, V. H. and BIRD, E. W. **The distribution of casein and non-casein proteins, calcium and phosphorus among skimmilk, buttermilk and butter serum from the same whole milk.** *J. Dairy Sci.*, 1953, **36**, 568. *Proc.* [Iowa State Coll., Ames.]

210

RANDOIN, L. and CAUSERET, J. La valeur nutritive des produits laitiers. 2. Laits en poudre et laits concentrés. [Nutritive value of milk products. 2. Powdered milks and concentrated milks.] *Bull. Soc. sci. Hyg. aliment.*, 1953, **41**, 23-33. [Inst. Nat. Recherches Agronom., Paris.]

211

PARKER, R. B. and ELLIKER, P. R. **Effect of spoilage bacteria on biacetyl content and flavor of cottage cheese.** *J. Dairy Sci.*, 1953, **36**, 843-849. [Dept. Bacteriol., Oregon Agric. Exp. Stat., Corvallis.]

212

RAY SARKAE, B. C., RYKALA, A. J. and DUNCAN, C. W. **The essential amino acid content of the proteins isolated from milk of the cow, ewe, sow, and mare.** *J. Dairy Sci.*, 1953, **36**, 859-864. [Dept. Agric. Chem., Michigan State Coll., East Lansing.]

The essential amino-acids were estimated microbiologically in the proteins of cow's, ewe's, sow's and mare's milk. The proteins of the milk from cows and from Shropshire, Rambouillet and Hampshire ewes were similar; the proteins of mare's milk had a higher arginine content and those of sow's milk a higher arginine and a lower leucine, tryptophan and valine content than the protein of cow's milk. The significance of these differences was doubtful, since only a small number of animals were used. The similarities in the amino-acid composition were contrasted with the marked differences in fatty acid composition of mammalian milks.—C. Warner.

213

KERIMOV, G. Moloko byuvolitits i produkty ego pererabotki. [Buffalo's milk and products made from it.] *Mol. Prom.*, 1953, **14**, No. 2, 36. [Trest. Maslodel. Prom., Azerbaidzhan SSR.]

Buffalo's milk contains twice as much fat as cow's milk, and also more protein and salts. It is white with a bluish tinge and has a characteristic taste and odour. The butter made from it is distinguished by its salty taste and a slight odour of volatile fatty acids. It is of a thick consistency

and contains more fatty acids of low molecular weight and less unsaturated fatty acids of high molecular weight than butter made from cow's milk. Cheese made from buffalo milk also has a characteristic taste and is very hard. The quality of the butter and cheese can be improved by changes in processing and is affected also by the diet of the buffaloes.—W. Hughes.

214

PHATAK, S. S. and PATWARDHAN, V. N. *Iso-oleic acids in cow and buffalo milk fat.* *Nature*, 1953, **172**, 456–457. [Nutrit. Res. Labs., Indian Council Med. Res., Coonoor.]

Ghee prepared from cow and buffalo butter fats was submitted to KMnO_4 oxidation and the dibasic acid fraction was separated by the method of Hilditch and Vidyarthi (*Proc. Roy. Soc. [A]*, 1929, **122**, 552). Ammonium salts of the dibasic acids were subjected to paper chromatography.

The chromatograms revealed the presence of suberic, azelaic, sebacic, undecanedioic and dodecanedioic acids. It was concluded that, in addition to oleic acid, other octadecanoic acids with double bonds at Δ^8 , Δ^{10} , Δ^{11} , and Δ^{12} exist in cow and buffalo butter fats.—G. A. Garton.

215

CAMA, J. S. and MEARA, M. L. *The component acids of milk fats of Balaenoptera physalus (finner whale).* *Biochem. J.*, 1953, **55**, 365–368. [Dept. Chem., Univ. Liverpool.]

Three samples of finner whale milk contained, respectively, fat 54.5, 40.4, 37.1, solids-not-fat 9.9, 4.9, 11.2, water 35.6, 54.7, 51.8 per cent. After saponification no lower fatty acid was found in the steam distillate. The component fatty acids of the whole fat were, in the 3 samples, respectively: myristic 7.1, 7.3, 10.0, palmitic 15.8, 16.6, 17.6, stearic 3.7, 2.9, 3.4, unsaturated acids, C_{14} , 1.0, 2.4, 1.4, C_{16} , 7.9, 6.2, 8.1, C_{18} , 29.7, 29.7, 26.6, C_{20} 18.2, 19.1, 17.6, C_{22} 15.9, 15.0, 15.0 per cent. Comparison with the data of Klem (*Hvålrad. Skr.*, 1935, **11**, 49) for blue whale milk fat and of Hilditch and Maddison (*Abst.* 2889, Vol. 18) for whale blubber showed close agreement for saturated acids. For unsaturated acids agreement was not so good, C_{16} and C_{18} acids being lower and C_{20} and C_{22} acids higher in milk than in blubber. Whale milk fat is more unsaturated than whale blubber, a finding opposite to that reported for the lactating seal (*Abst.* 1715, Vol. 22 and Carden, 1952, *Thesis*, Univ. Liverpool).—D. Harvey.

Eggs

216

EVANS, R. J., BANDEMER, S. L., LIBBY, D. A. and GROSCHKE, A. C. *The arsenic content of*

eggs from hens fed arsanilic acid. *Poultry Sci.*, 1953, **32**, 743–744. [Dept. Agric. Chem., Michigan State Coll., East Lansing.]

Three groups of 20 Rhode Island Red pullets were given an all-mash breeder ration. From the 4th to 14th weeks inclusive, group 2 received 90 g. and group 3, 180 g. arsanilic acid per ton of feed. The eggs from the birds of group 3 always contained most As. The As content of the eggs from both groups reached a maximum at the end of the 7th week of the experiment and then declined, which showed that a tolerance for the element had developed. The highest As content found in any egg was 0.532 p.p.m. As_2O_3 . There was almost no As in eggs laid during the 17th week, when the experiment ended.—M. J. Head.

217

TÄUFEL, K. and POHLOUDEK-FABINI, R. *Verteilung der Citronensäure in Vogeleiern und ihr Verhalten bei der Bebrütung. [Distribution of citric acid in bird's eggs and its behaviour during incubation.]* *Ztschr. Lebensmittel-Untersuch. Forsch.*, 1953, **96**, 397–405. [Inst. Ernährungsforsch., Potsdam, Rehbrücke.]

Colorimetric estimations of citric acid by the pentabromoacetone method in a series of 8 eggs from Leghorn hens showed that of the total citric acid content per egg, taking the average for the series, 73.69 per cent. was contained in the shell, 19.84 per cent. in the yolk and 6.47 per cent. in the white. The range of variation in each part was considerable, in the shell, for example, the average amount of citric acid per egg was 7.06 mg. with a range from 4.00 to 9.09 mg.; in the yolk the range was 1.51 to 2.38 mg., and in the white 0.46 to 0.92 mg. Analysis of single eggs of other domestic birds showed that for the turkey, guinea hen and bantam the greater part of the citric acid was contained in the shell, as in the hen's egg, but for the goose, duck and pigeon the greater portion was within the egg. Incubation tests on hen's eggs showed that during development of the embryo there was endogenous formation of citric acid. The significance of the experimental data is discussed.—M. B. Richards.

218

CEDRANGOLO, F., FIDANZA, F., QUAGLIARIELLO, E. and GIOIA, A. *Interrelations entre proline, oxyproline, arginine et acide glutamique dans l'oeuf de poule pendant le développement embryonnaire. [Interrelations between proline, hydroxyproline, arginine and glutamic acid in the hen's egg during development of the embryo.]* *Arch. Sci. biol., Bologna*, 1953, **37**, 260–276. [Inst. Chim., Univ. Naples.]

Meat (all kinds)

219

PALOHEIMO, L. (with HENTUNEN, I., KUKKONEN, I., PALOHEIMO, I., SALMINIITY, S., SIHVOLA, A. and TUOMALA, L.) Über die Zusammensetzung des Körpers der Milchkühe. [**Composition of the body of the milk cow.**] *Acta agral. fenn.*, 1944, **56**, No. 1, 1-63. [Inst. Haustierlehre, Univ. Helsinki.]

Twenty-three cows, 16 Finnish and 7 Ayrshire, of different ages and grades of fatness were slaughtered and submitted to complete mechanical analysis as in standard slaughter trials. In 3 animals organs and tissues were separately analysed for moisture, protein, fat and ash. In the remaining 20 the following fat estimations were made: (1) mesenteric fat attached to or surrounding the intestinal tract and the uterus, (2) kidney fat, (3) adipose tissue of the organs in the chest cavity, (4) udder fat, (5) subcutaneous fatty tissues of the right half-carcase, (6) fat in the flesh of the right half-carcase. From the results of these analyses, using coefficients obtained from the complete analyses of the 3 animals, a clear picture was obtained of the general composition of the body of a cow. The residual fat which was not accounted for by the above estimations was independent of fatness and amounted on the average to 3.7 per cent. of the net weight of the animal, which was defined as the liveweight minus the weight of the contents of the alimentary tract and bladder. This residual fat is termed "constant fat" as distinct from the "reserve fat" estimated in the standard analyses.

Most of the constant fat consisted of bone fat, the difference being only 1.1 per cent. of the net weight. The net weight minus the reserve fat is termed the "fat-poor weight" and deducting from this a certain part of the fat-free flesh the "lean weight" is obtained. The proportion of fat-free flesh ("variable flesh") was calculated on the basis of one very thin animal which contained 38.1 per cent. of flesh which was termed "constant flesh", and no "variable flesh".

For the 23 cows, slaughterhouse refuse represented 10.7 to 33.8 per cent. of the liveweight. From the averages for the Finnish breed the net weight multiplied by 1.25 gave the liveweight. On the net liveweight basis the following percentage ranges were obtained: blood 6.2 to 7.8; skin 6.5 to 10.1; carcase weight, warm, 52.1 to 65.6; bone 10.7 to 19.5; total fat 7.7 to 26.5, fat-free flesh 35.3 to 42.5. The following percentages were calculated on the warm carcase weight: bone 13.6 to 27.7, carcase fat less bone fat 4.4 to 27.1, kidney fat 0.5 to 5.8, subcutaneous fat 0.1 to 6.2, fat-free flesh 56.4 to 74.1. The fat content of the bones was about 20 per cent. and appeared to be uninfluenced by the degree of

fatness of the animal. The fat content of the flesh, with subcutaneous tissue, varied between 4.9 and 26.5 per cent. Of the total body fat 36.9 to 50.8 per cent. was in the body cavity and 47.7 to 62.2 per cent. in the flesh.

Comparison of the results for cows of different degrees of fatness made it possible, by calculation of the different fat and flesh fractions as percentages of the lean weight, to arrive at certain provisional conclusions about the process of fat utilisation or loss of weight in cows. The increases in reserve fat and of fat-free flesh appear to run parallel, but after the cow has become medium-fat, flesh increase falls behind fat increase. The main reserves of fat, the fat in the body cavity and in the flesh, increase the whole time in roughly constant proportion. In the final stages of fattening the increase in kidney fat and especially in subcutaneous fat is proportionately greater than that of total fat.—W. Godden.

220

DOTY, D. M., WANG, H. and AUERBACH, E. Dehydrated foods. **Chemical and histological properties of dehydrated meat.** *J. Agric. Food Chem.*, 1953, **1**, 664-668. [American Meat Inst. Found., Chicago, Ill.]

A review.

221

GUNSTONE, F. D. and PATON, R. P. **Animal fats. 1. The component acids of deer fat and of camel fat. 2. The component acids of python fat.** *Biochem. J.*, 1953, **54**, 617-621; 621-625. [Chem. Dept., Univ. Glasgow.]

1. Depot fat was extracted from the tissues of a Scottish stag (*Cervus elaphus*) and of a male bactrian camel (*Camelus bactrianus*). The mixed fatty acids of each fat were separated into groups by low-temperature crystallisation from solutions in methanol and acetone. Each group of acids was converted to methyl esters, which were fractionally distilled *in vacuo*. The fatty acid composition of each fraction was then estimated and the composition of the whole fat derived.

Both fats contained palmitic, stearic and oleic acids as major components, together with smaller amounts of myristic, arachidic, tetradecenoic, hexadecenoic, octadecadienoic and octadecatrienoic acids; camel fat contained some higher unsaturated acids also.

2. Fat attached to the intestines of a female reticulated python (*Python reticulatus*) was extracted with acetone. The mixed fatty acids were treated as above.

The major component acids were palmitic 19.7, stearic 10.8, oleic 47.1 and octadecadienoic 10.7 per cent., the latter consisting almost entirely of "seed fat" linoleic acid. Other acids present in

smaller amounts included myristic, arachidic, tetradecenoic, hexadecenoic, octadecatrienoic and higher unsaturated acids.

The results are similar to others previously reported for amphibians and reptiles and support the generalisation that fats of this type are intermediate in composition between the fats of fish and higher terrestrial animals.—G. A. Garton.

See also Abst. 1327.

Fish

222

LEVANIDOV, I. P. [The chemical composition of the flesh of herring from the western coast of Sakhalin.] *Rybnoe Khozyaistvo*, 1950, 26, No. 2, 37.

223

SANDOVAL COLMENARES, T. Análisis químico-bromatológico del *Scartichthys Gigas* o "Borracho". [Chemical and bromatological analysis of *Scartichthys gigas* or "borracho".] *An. Fac. Farm. Bioquim.*, Lima, 1951, 2, 271-275. [Lab. Bromatol., Univ. Nac. Mayor de San Marcos, Lima.]

A sample of "borracho" purchased in the Lima market was analysed and the results are presented in detail. The energy and nutritive values of borracho compared favourably with those for other common fish. The flesh contained on the average 19.96 per cent. protein on a fresh basis and the fat, 1.64 per cent., contained 9000 I.U. vitamin A per g.

The popular belief that drinking a broth prepared from the flesh of borracho induces somnolence is unfounded.—P. C. Jowsey.

224

HORTENCIA OLIVEROS, E. Hidrólisis y valoración de amino-acidos indispensables en la proteína de los peces de los ríos peruanos. (Histidina, metionina, tirosina y triptofano.) [Hydrolysis of and estimation of essential amino-acids in the protein of the fish of Peruvian rivers; histidine, methionine, tyrosine, tryptophan.] *An. Fac. Farm. Bioquim.*, Lima, 1951, 2, 239-247. [Lab. Bromatol., Univ. Nac. Mayor de San Marcos, Lima.]

Histidine, methionine, tyrosine and tryptophan were estimated in the proteins of 4 species of fish from Peruvian rivers. Histidine was estimated by the Lang modification of the Pauly Weiss method, methionine by the direct colorimetric method of McCarthy and Sullivan, tyrosine and tryptophan by the method of Folin and Ciocalteu. The fish and the percentage contents of the amino-acids in the above order were: paiche (*Arapaima gigas*) 1.38, 4.161, 3.10, 1.62; trucha (*Salmo* sp.) 0.531,

3.404, 2.35, 1.16; bagre (gen. *Pygidium*) 0.353, 3.936, 2.01, 0.73; and carp (*Cyprinus carpio*) 0.622, 3.96, 3.56, 0.68.—M. B. Richards.

225

PALLARDEL PERALTA, T. H. Hidrólisis y valoración de amino-acidos indispensables, histidina y metionina, en la proteína de peces de la costa Peruana. [Hydrolysis of and estimation of essential amino-acids, histidine and methionine, in the protein of fish from the coast of Peru.] *An. Fac. Farm. Bioquim.*, Lima, 1951, 2, 248-256. [Lab. Bromatol., Univ. Nac. Mayor de San Marcos, Lima.]

Histidine and methionine were estimated in the proteins of 10 species of fish from the coast of Peru; the methods were as in the preceding Abst. The fish and the percentages of histidine and methionine found were: bonito (*Sarda chilensis*) 1.036, 3.483; borracho (*Scartichthys gigas*) 0.410, 2.615; corvina (*Sciaena gilberti*) 0.387, 3.916; cojinova (*Neptomenus grasus*) 0.473, 1.792; lorna (*Sciaena deliciosa*) 0.496, 1.853; liza (*Mugi peruanus*) 0.633, 3.185; lenguado (*Paralichthys adpersus*) 0.867, 1.270; pejerrey (*Austromenida regia*) 0.709, 3.795; ray (*Dasyatis brevis*) 0.583, 1.353; tollo (*Mustus dorsalis*), 0.594, 2.409.

M. B. Richards.

226

ZANONI, V., T. Análisis bromatológico de la carne de "Aetobatus Peruvianus" o Raya. [Bromatological analysis of the flesh of *Aetobatus peruvianus*, or ray.] *An. Fac. Farm. Bioquim.*, Lima, 1951, 2, 282-286. [Lab. Bromatol., Univ. Nac. Mayor de San Marcos, Lima.]

The flesh of *Aetobatus peruvianus* had the following percentage composition: moisture 75.56, total protein 20.99, fat 0.870, ash 1.979, carbohydrates 0.094, tyrosine 2.288, and tryptophan 1.007. Vitamin A content was 39,700 I.U. per g. fat. The energy value was 92.166 Cal. per 100 g. fresh material. The ash contained: Ca 0.066, P 0.308, Cl 0.115, I 0.0061 g. and Fe 0.743 mg. per 100 g. These characteristics, and its agreeable taste, make it an acceptable food for man.

M. B. Richards.

227

HORNA ACOSTA, B. Estudio bromatológico de la carne del "Geniapterus Maculatus" o Congrio. [Bromatological study of the flesh of *Geniapterus maculatus*, or conger-eel.] *An. Fac. Farm. Bioquim.*, Lima, 1951, 2, 276-281. [Lab. Bromatol., Univ. Nac. Mayor de San Marcos, Lima.]

Details are given of the chemical composition of conger-eel flesh purchased in Lima market. The total protein content was 17.63 per cent. on a

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fresh basis, of which 15.77 per cent. was digestible. Fat amounted to 2.14 per cent. and contained 16,200 I.U. vitamin A per g. Vitamin D was present but was not estimated.—P. C. Jowsey.

228

VENKATARAMAN, R. and CHARI, S. T. **Studies on mackerel fat variations: correlation of plankton fat with fat of fish.** *Proc. Indian Acad. Sci. [B]*, 1953, **37**, 224–227. [Fish. Technol. Stat., Kozhikode.]

Fat was estimated at monthly intervals for 18 months in the flesh and whole body of mackerel (*Rastrelliger kanagurta*) and in plankton collected in the same fishing grounds. No statistical analysis was made, but it is considered that there is some correlation between the fat contents of plankton and mackerel.—P. C. Jowsey.

229

OLLEY, J. and LOVERN, J. A. **The lipids of fish. 3. The acetone-insoluble fraction of an acetone extract of the flesh of the haddock.** *Biochem. J.*, 1953, **54**, 559–569. [D.S.I.R., Torry Res. Stat., Aberdeen.]

For parts 1 and 2 see Abst 4042, Vol. 23.

It was observed that some of the lipids present in a crude acetone extract of haddock flesh were, after purification, almost insoluble in acetone at 0° C. This material was fractionated by counter-current distribution between light petroleum and 85 per cent. (v/v) ethanol, some of the products being further fractionated according to their solubility in absolute alcohol at –30° C. Two fractions consisting mainly of lecithin and two consisting largely of an unidentified lipid were obtained and submitted to detailed fatty acid analysis. The lecithins differed from those isolated previously from the acetone-soluble fractions of the same total tissue extract. The unidentified lipid contained a higher ratio of fatty acids to glycerophosphate than any known glycerophosphatide. Attention is drawn to certain analytical difficulties which were encountered, particularly the apparent loss of both N and P during the hydrolysis of phospholipins.—W. Godden.

230

SHORLAND, F. B. **New Zealand fish oils. 6. Seasonal variations in the composition of New Zealand groper (*Polyprion oxygeneios*) liver oil.** *Biochem. J.*, 1953, **54**, 673–677. [Fats Res. Lab., D.S.I.R., Wellington, N.Z.]

Samples comprising from 8 to 53 livers were obtained at intervals of about 2 months over the period 1938 to 1943. The livers were weighed and analysed. Some samples of pyloric caeca and intestines were also analysed.

The percentages of vitamin A, cholesterol, total

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unsaponifiable matter and phospholipin as well as the iodine value of the liver oil increased significantly just after spawning, when the oil content of the liver was low. The oil content of the pyloric caeca decreased also during September to October, but without the spectacular rise in vitamin A content observed in the liver oil at this period. Vitamin A reserves were concentrated almost entirely in the liver, with smaller amounts in the pyloric caeca. Although the percentage of oil increased with the size of the liver the total vitamin A, cholesterol, total unsaponifiable matter and lipid P in the liver were relatively unaffected.

W. Godden.

231

CANALES, H. **Estudio bromatológico de algunas harinas de pescado. [Bromatological study of some fishmeals.]** *An. Fac. Farm. Bioquim., Lima*, 1951, **2**, 257–270. [Lab. Tecnol. Pesquera Callao, Univ. Nac. Mayor de San Marcos.]

Nine samples of fishmeals from factories in Peru were analysed. Protein ranged from 54.25 to 77.00, fat from 6.15 to 22.49, and ash from 6.68 to 27.68 per cent. For use in animal feeding, high protein content and low fat content are the most important points. Fat should not exceed from 7 to 10 per cent.; higher amounts may give a disagreeable smell and taste to the feed, and may cause digestive disturbances. The best meals analysed were a whalemeal and a "machete" meal prepared by one factory. These had protein contents of 77.00 and 57.25 and fat contents of 6.25 and 6.60 per cent. A sample of "bonito" meal and one of "anchoveta" meal from different factories had high protein contents, 59.50 and 62.56 per cent., but contained too high a percentage of fat, 12.72 and 10.49, respectively. Three samples of bonito/atún meal from one factory had fat contents of 19.66, 22.49 and 17.45 per cent., respectively. This indicates some defect in the manufacturing process. It is urged that the factories should aim at producing meals of low fat content. One factory which used liquefied butane as organic solvent obtained fat contents as low as 2.26 per cent.—M. B. Richards.

FOODSTUFFS OF VEGETABLE ORIGIN

General

232

MUNSELL, H. E., WILLIAMS, L. O., GUILD, L. P., KELLEY, L. T. and HARRIS, R. S. **Composición de las plantas alimenticias de Centro America. 8. [7]. Honduras. [Composition of the food plants of Central America. 8. [7]. Honduras.]**

MUNSELL, H. E., WILLIAMS, L. O., GUILD, L. P., KELLEY, L. T., McNALLY, A. M. and HARRIS,

R. S. 8. Guatemala. [8. Guatemala.] *Bol. Ofic. sanit. panamer.*, 1953, **34**, 352-371; 492-507. [Lab. Biochem. Nutrit., Massachusetts Inst. Technol., Cambridge.]

See Abst. 197, Vol. 21.

233

MUNSELL, H. E., CASTILLO, R., ZURITA, C. and PORTILLA, J. M. **Production, uses, and composition of foods of plant origin from Ecuador.** *Food Res.*, 1953, **18**, 319-342. [Nat. Inst. Nutrit. Ecuador, Quito.]

Analyses of 131 samples of foods are presented in detail.—P. C. Jowsey.

234

SCHMITT, H. P. and JESSEN, R. J. **Foods evaluation. Sampling plan for nutrition research program on frozen fruits, juices, and vegetables.** *J. Agric. Food Chem.*, 1953, **1**, 730-734. [Dept. Res. Standards, Washington 5, D.C.]

A sampling plan is outlined for a comprehensive investigation of the composition and nutritive value of some 48 frozen fruits, fruit juices and vegetables to be undertaken by the National Association of Frozen Food Packers, Washington, during the 1953 and 1954 packing seasons. Data will be reported later.—J. S. Thomson.

See also Abst. 1245.

Cereals

235

NEWTON, J. D. **Influence of soil zone on the chemical composition of cereals in Alberta.** *Canad. J. Agric. Sci.*, 1953, **33**, 359-363. [Univ. Alberta, Edmonton.]

236

IRVINE, G. N. and ANDERSON, J. A. **Note on the lipoxidase activity of various North American wheats.** *Cereal Chem.*, 1953, **30**, 255-257. [Grain Res. Lab., Winnipeg, Manitoba.]

237

WHITE, L. M. and SECOR, G. E. **Chromatographic evidence for the occurrence of a fructosyl raffinose in wheat flour and wheat.** *Arch. Biochem. Biophys.*, 1953, **44**, 244-245. [W. Reg. Res. Lab., Bur. Agric. Indust. Chem., Albany, Calif.]

238

PENCE, J. W. and ELDER, A. H. **The albumin and globulin proteins of wheat.** *Cereal Chem.*, 1953, **30**, 275-287. [W. Reg. Res. Lab., Albany, Calif.]

A commercial unbleached flour milled from soft wheats was used. Albumins were extracted with

a dilute phosphate buffer and separated from gliadin and pentosans by ammonium sulphate fractionation. The preparation was fairly homogeneous in the ultracentrifuge but heterogeneous on electrophoresis; paper electrophoresis showed at least 6 components. The mol. wt., calculated from osmotic pressure measurements, was 28,000 in dilute saline, but 17,000 in the presence of urea or sodium salicylate. Dialysis of these preparations caused some of the protein to precipitate and the remainder showed a mol. wt. of 28,000 in saline. The total N content was 17.1 per cent., of which 8.3 per cent. was amide N, 2.6 per cent. tryptophan N and 16.3 per cent. arginine N.

Globulins were extracted with *M* NaCl and fractionated with ammonium sulphate. In the ultracentrifuge α - and γ -globulins were found, with a small amount of a substance of high mol. wt. thought to correspond to the δ -globulin previously found in barley but not in wheat. The total N content was 18.6 per cent., of which 6.0 per cent. was amide N, 0.73 per cent. tryptophan N and 29.5 per cent. arginine N.—C. Warner.

239

KURKELA, R., KORHONEN, E., ROSSANDER, M. and ROINE, P. **Suomalaisen leivän fytiinihappopitoisuudesta. [Phytic acid content of Finnish breads.]** *Maataloust. Aikakausk.*, 1953, **25**, 84-92. [Dept. Nutrit. Chem., Univ. Helsinki.] English summary.

Phytic acid P was estimated by the method of McCance and Widdowson (Abst. 4339, Vol. 5) in 60 samples of the 9 commonest types of bread used in Finland and in the corresponding flours, and the results are tabulated. Among the breads, whole wheat and whole barley breads made with yeast retained most, from 120 to 170 mg. phytic acid P per 100 g. dry matter. The phytic acid content of rye bread decreased with increasing acidity and some kinds had very little; more was destroyed by a 3-phase baking process than by a 2-phase. Hard rye bread retained considerably more than soft rye bread of the same acidity.

Average daily consumption of cereals per head in Finland has been estimated to be 315 g.; about 100 g. rye, 50 g. whole wheat, 125 g. white wheat flour, and the rest oats and barley. On the assumption that rye and wheat are consumed as bread and the others as porridge, it was calculated that the daily intake of phytic acid P is about 155 mg. from bread and 75 mg. from porridge. This could bind 240 mg. Ca. Since the cereals themselves contain about 90 mg. Ca, about 150 mg. Ca from other foods might be rendered unavailable; but since the average Finnish diet provides at least 1300 mg. Ca daily, the loss due to phytic acid in cereals is not considered serious. (From summary.)

W. M. Deans.

240

BRESSANI, R., ARROYAVE, G. and SCRIMSHAW, N. S. **The nutritive value of Central American corns.** 1. Nitrogen, ether extract, crude fiber, and minerals of twenty-four varieties in Guatemala.

AGUIRRE, F., ROBLES, C. E. and SCRIMSHAW, N. S. 2. Lysine and methionine content of twenty-three varieties in Guatemala.

AGUIRRE, F., BRESSANI, R. and SCRIMSHAW, N. S. 3. Tryptophane, niacin, thiamine, and riboflavin content of twenty-three varieties in Guatemala. *Food Res.*, 1953, 18, 261-267; 268-272; 273-279. [Inst. Nutric. Centro América y Panamá, Guatemala.]

1. The results are presented in detail. Average values, range in brackets, were: total N 1.52 (1.09 to 1.92), protein (N \times 6.25) 9.5 (6.8 to 12.0), fat 5.63 (3.80 to 7.62), crude fibre 1.40 (1.0 to 1.8), ash 1.48 (1.08 to 1.85) per cent., P 320 (212 to 424), Fe 3.00 (1.98 to 5.32) mg. per 100 g., all calculated to 10 per cent. moisture content.

2. The results are presented in detail. Average values and ranges, estimated microbiologically, were: methionine 0.14 (0.10 to 0.22), lysine 0.32 (0.28 to 0.40) per cent., calculated to 10 per cent. moisture content.

3. Tryptophan and nicotinic acid were estimated microbiologically, riboflavin fluorimetrically and vitamin B₁ by the thiochrome method. The results are presented in detail. Average results and ranges were: tryptophan 0.046 (0.025 to 0.059) per cent., nicotinic acid 1.77 (1.25 to 2.67), riboflavin 0.08 (0.05 to 0.11), vitamin B₁ 0.52 (0.37 to 0.71) mg. per 100 g., all calculated to 10 per cent. moisture content.—P. C. Jowsey.

241

WILLIAMS, K. T. and BEVENUE, A. **A note on the sugars in rice.** *Cereal Chem.*, 1953, 30, 267-269. [W. Reg. Res. Lab., Albany, Calif.]

Total and reducing sugars were estimated in brown and white rices of the varieties California Pearl, Texas Century Patna and California Mochi Gome and in parboiled rices of the first 2 varieties.

Reducing sugars in brown, white and parboiled rices had the following ranges, respectively: 0.09 to 0.13; 0.05 to 0.08 and 0.14 to 0.19 per cent. on a dry matter basis. On the same basis, the ranges for total sugars in the 3 rices were 0.83 to 1.40, 0.37 to 0.53 and 0.66 to 1.06 per cent.

P. C. Jowsey.

242

CHANDRASEKHARA, M. R. and SWAMINATHAN, M. **Pyrophosphatases of ragi and ragi malt.** *Bull. Central Food Technol. Res. Inst. Mysore*, 1953, 2, 212-213. [Div. Biochem. Nutrit., C.F.T.R.I., Mysore.]

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Leafy Vegetables

243

KELLEY, E. G. and BAUM, R. R. **Protein amino acids contents of vegetable leaf proteins.** *J. Agric. Food Chem.*, 1953, 1, 680-683. [E. Reg. Res. Lab., Philadelphia 18, Pa.]

Histidine, arginine, lysine, leucine, isoleucine, valine, methionine, threonine, phenylalanine and tryptophan were estimated microbiologically in meals and protein extracts prepared from the leaves of beet, broccoli, carrot, celery, kale, lima bean, maize, pea, rhubarb, spinach and turnip.

The leaf meals contained similar amounts of the 10 amino-acids and were considered to be nutritionally well balanced. The total amino-acid content of each leaf meal was about 75 per cent. that of the corresponding protein extract.—P. C. Jowsey.

Legumes

244

DAVID, J. J. and JOSLYN, M. A. **Acetaldehyde and related compounds in frozen green peas.** *Food Res.*, 1953, 18, 390-398. [Dept. Food Technol., Univ. California, Berkeley.]

245

KLIMENKO, V. G. **Formy azota semyan i belkov nuta (Cicer arietinum) L. [Forms of nitrogen in seeds and proteins of the chickpea (Cicer arietinum, L.).]** *Biokhimiya*, 1953, 18, 12-18. [Lab. Biokhim. Rastenii, Kishinevsk. Gosud. Univ.]

The effect of variety and year of harvest on the distribution of N in the seeds and proteins of 8 varieties of chickpea was investigated. Total N in seeds grown in the same year ranged from 2.95 to 3.44 per cent. according to variety, and total N for any particular variety varied from year to year. Total S and the percentage of methionine and cystine differed slightly with variety; the year of harvest had a considerable effect on the amounts of S and S amino-acids. The amount of mono-aminodicarboxylic N was independent of variety, but the year of harvest had some effect. There was a considerable intervarietal difference between the lysine contents of the seeds, but the arginine and histidine contents were fairly constant. The results showed the importance of breeding for increased assimilable amino-acids.—W. Hughes.

246

DJANG, S. S. T., LILLEVIK, H. A. and BALL, C. D. **Factors affecting solubilization of the nitrogenous constituents of the Mung bean, *Phaseolus aureus*.** *Cereal Chem.*, 1953, 30, 230-235. [Kedzie Chem. Lab., Michigan State Coll., East Lansing.]

Mung beans were ground to pass sieves of 20, 40 and 60 mesh and samples of from 5 to 15 g.

in 2.5 g. steps were extracted with a constant volume, 100 ml., of 0.4 M NaCl under fixed conditions of temperature, time and agitation. After centrifuging at 2000 r.p.m. for 15 min., protein was estimated in the supernatant liquid.

The solubility of the protein increased with decreasing particle size and with a high ratio of sample to solvent. With 60-mesh meal, extraction was almost complete with either hand or mechanical shaking. By successive extractions, 60, then 10, then 5 per cent. of the N was removed. Below 45° C. the yield of N from lipid-free meal was greater than that from meal containing lipid. Above this temperature the reverse was true.

P. C. Jowsey.

247

REYNOLDS, H., GILPIN, G. L. and HORNSTEIN, I. **Palatability and chemical studies on peanuts grown in rotation with cotton dusted with insecticides containing benzene hexachloride.** *J. Agric. Food Chem.*, 1953, **1**, 772-776. [Bur. Human Nutrit., U.S. Dept. Agric., Washington 25, D.C.]

Eighty-two samples of groundnuts were collected from areas that had previously carried crops of cotton treated with benzene hexachloride. Peanut butter was prepared and each sample was judged by a trained panel. The results were inconclusive and inconsistencies arose especially when the flavour was at the threshold level. The judges were re-trained before further tests.

Two samples of groundnuts from plots which had carried cotton treated with 3.8 and 5.14 lb. per acre of the γ -isomer were judged to have off-flavours. There was some evidence that the flavour of benzene hexachloride may depend on the form in which it is present, since samples to which it had been added in amounts greater than those in the test samples were rated the same as control samples not containing it.—D. Harvey.

248

VAN HANDEL, E. **A new phosphoaminolipid from soya-phosphatides. Preliminary communication.** *Rec. Trav. chim. Pays-Bas*, 1953, **72**, 763. [Lab. Physiol. Chem., Univ. Amsterdam.]

In a study of the application of the method of Schmidt *et al.* (*J. Biol. Chem.*, 1946, **166**, 505) to the estimation of sphingomyelin a component of soya phosphatides was found which contained N and did not yield choline. A structure of 2 long chain bases linked by 1 atom of P is suggested.

D. Harvey.

249

CHARGAFF, E. and HAWTHORNE, J. N. **Studies of the inositol-containing lipids of soya bean.** *Biochem. J.*, 1953, **54**, xxxviii-xxxix. [Coll. Phys. Surg., New York 32.]

250

PALLANSCH, M. J. and LIENER, I. E. **Soyin, a toxic protein from the soybean. 2. Physical characterization.** *Arch. Biochem. Biophys.*, 1953, **45**, 366-374. [Dept. Agric. Biochem., Univ. Minnesota, St. Paul 1.]

251

LIENER, I. E. and ROSE, J. E. **Soyin, a toxic protein from soybean. 3. Immunochemical properties.** *Proc. Soc. Exp. Biol. Med.*, 1953, **83**, 539-544. [Dept. Agric. Biochem., Univ. Minnesota, St. Paul.]

See also Abst. 186.

Fruits

252

DEYA RODRIGUEZ, G. **Contribución al estudio bromatológico de la Mammea Americana. [Contribution to the bromatological study of mammee fruit (*Mammea americana*).]** *An. Fac. Farm. Bioquim., Lima*, 1951, **2**, 226-228. [Lab. Bromatol., Univ. Nac. Mayor de San Marcos, Lima.]

253

GARCIA SANJUAN, J., VIGUERA LOBO, J. M. and ROYO IRANZO, J. **Approvechamiento de los residuos de la industrialización de los agrios. 5. Estudio químico de los piensos preparados a partir de frutos cítricos Españoles. A. Composición en sus constituyentes fundamentales. [Use of the residues from industrial processing of fruits. 5. Chemical study of feeds prepared from Spanish citrus fruits. A. Proximate composition.]** *Bol. Inst. nac. Invest. agronom., Madrid*, 1953, **13**, 1-27. [Dept. Quim. Vegetal.] French summary.

Of the 16 feeds analysed, 7 were commercially produced from orange residues or whole fruit and the rest were processed in the laboratory from whole oranges (4 samples), whole lemons (3 samples) and whole grapefruit (2 samples). The method of processing varied in minor details, but consisted of grinding, neutralising with lime, pressing and drying, either artificially in a rotary drum drier or by exposure to the air or sun.

The samples were similar in composition and the mean composition of the 16 feeds was: crude protein 7.46, fat 3.42, crude fibre 13.08, ash 6.82, pentosans 17.43, total sugars 14.15, reducing sugars 10.88, pectin 8.91 per cent. on a dry matter basis. The average moisture content was 10.73 per cent.

Removal of the seeds before processing reduced the protein and fat contents; apart from this, the composition of the feed was affected by the species and variety and by the degree of ripeness. Rapid drying of the feed, as in the commercial samples,

N.A. and R., January 1954

reduced losses by fermentation and produced a feed similar in composition to the original material.

P. C. Jowsey.

254

HAY, J. G. and PRIDHAM, J. B. **Free xylose in fruits.** *Nature*, 1953, **172**, 207. [Dept. Biol. Chem., Univ. Bristol.]

255

HUSKINS, C. W. and SWIFT, L. J. **Changes in the lipid fraction of Valencia orange juice during pasteurization.** *Food Res.*, 1953, **18**, 305-307. [U.S. Citrus Prod. Stat., Winter Haven, Fla.]

The lipids of pasteurised Valencia orange juice contained 16.53 per cent. of unsaponifiable matter and those of fresh juice 19.05 per cent. There was no difference in lipid composition which could account for the change in flavour caused by pasteurisation.

For a previous paper see Title 1743, Vol. 22.

D. Harvey.

256

HUSKINS, C. W. and SWIFT, L. J. **Storage changes in the phosphorus, nitrogen, and fatty acid constituents of the lipid in canned Florida Valencia orange juice.** *Food Res.*, 1953, **18**, 360-363. [U.S. Citrus Products Stat., Winter Haven, Fla.]

Total N, choline N, amino-N, other N (by difference), total P, total fatty acids and constituent conjugated and non-conjugated acids were estimated in the juice lipid of Valencia oranges before and after 6 and 12 months' storage of the juice in cans.

Over a period of 12 months total N decreased from 0.73 to 0.44 per cent.; choline N was particularly affected, falling from 0.27 to 0.08 per cent. Total P fell from 1.40 to 0.63 per cent. over the same period, most of the loss occurring during the first 6 months. Fatty acids increased over 12 months from 57.55 to 64.24 per cent. The iodine value fell from an initial value of 115.0 to 106.7 after 12 months.—P. C. Jowsey.

257

KIRCHNER, J. G., MILLER, J. M., RICE, R. G., KELLER, G. J. and FOX, M. M. **Citrus flavoring. Volatile water-soluble constituents of grapefruit juice.**

KIRCHNER, J. G. and MILLER, J. M. **Volatile oil constituents of grapefruit juice.** *J. Agric. Food Chem.*, 1953, **1**, 510-512; 512-518. [Fruit and Vegetable Chem. Lab., U.S. Dept. Agric., Pasadena 5, Calif.]

258

CUBAS ALVAREZ, J. A. **Análisis químico bromatológico de las aceitunas (Olea Europea).**

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[**Chemical and bromatological study of olives (Olea europea).**] *An. Fac. Farm. Bioquim., Lima*, 1951, **2**, 219-225. [Lab. Invest., Univ. Nac. Mayor de San Marcos, Lima.]

Green (fresh), dried and brine-stored olives from 3 centres were analysed and the results are presented in detail.

Typical results for samples in the above order were: ether extract 18.65, 56.86, 27.52; protein 2.36, 3.94, 3.36; ash 2.76, 4.01, 6.66 and dry matter 29.24, 75.32, 42.12, all as percentages of the weight of each type of fruit. Carotene contents of the oils were 2.24, 9.44 and 7.1 mg. per g., respectively. The brine-stored samples had a relatively high chloride content, 3.91 per cent., compared with the fresh and dried samples, 1.98 and 0.94 per cent., respectively.

Organoleptic characters of the samples are listed also.—P. C. Jowsey.

Other Types

259

FLORES FLORES, A. **Estudio químico-bromatológico del Allium Sativum (Ajo) y Allium Cepa (Cebolla).** [Chemical and bromatological study of *Allium sativum* (garlic) and *Allium cepa* (onion).] *An. Fac. Farm. Bioquim., Lima*, 1951, **2**, 229-233. [Lab. Bromatol., Univ. Nac. Mayor de San Marcos, Lima.]

Details of the composition of red and white onions and red and white garlic are presented.

P. C. Jowsey.

260

CHANNING, D. M. and YOUNG, G. T. **Amino-acids and peptides. 10. The nitrogenous constituents of some marine algae.** *J. Chem. Soc.*, 1953, 2481-2491. [Dyson Perrins Lab., Univ. Oxford.]

The chemical distribution of N in *Laminaria saccharina*, *L. cloustoni*, *Ascophyllum nodosum*, *Pelvetia canaliculata* and *Rhododymenia palmata* was investigated.

Peptides and proteins accounted for most of the organic N; small amounts of volatile bases were present and in *L. cloustoni* and *R. palmata* appreciable amounts of free α -amino-acids were detected. Amino-acids were identified chromatographically in hydrolysates of 4 of the seaweeds and some were estimated quantitatively.

A new reagent, 1-bromo-2-fluoro-3:5-dinitrobenzene, was used to estimate the reactive groups in peptides. Full details of techniques are given.

P. C. Jowsey.

261

COULSON, C. B. **Amino-acids of marine algae.** *Chem. and Indust.*, 1953, No. 37, 971-972. [Inst. Seaweed Res., Inveresk, Midlothian.]

Amino-acids occurring free and in peptide form were investigated in the seaweeds *Ascophyllum*

nodosum, *Pelvetia canaliculata*, *Fucus vesiculosus*, *Laminaria saccharina*, *L. cloustoni*, *Rhodomenia palmata* and *Gigartina stellata*. A list of the acids identified in hydrolysed ethanolic extracts of the seaweeds is presented.—P. C. Jowsey.

262

COULSON, C. B. **Proteins of marine algae.** *Chem. and Indust.*, 1953, No. 38, 997-998. [Inst. Seaweed Res., Inveresk, Midlothian.]

Proteins were extracted from dried, milled samples of *Rhodomenia palmata*, *Pelvetia canaliculata*, *Ascophyllum nodosum* and *Laminaria cloustoni* and from fresh samples of *Enteromorpha intestinalis*, *Porphyra umbilicus*, *A. nodosum* and *L. digitata*. After alkaline or acid hydrolysis the amino-acids were identified chromatographically. Lists of the amino-acids found are presented.

Histidine, though present in the fresh seaweeds, was not found in the dried samples. Its absence was thought to be due to drying and/or the method of extraction.—P. C. Jowsey.

263

ROSS, A. G. **Some typical analyses of red seaweeds.** *J. Sci. Food Agric.*, 1953, 4, 333-335. [Dept. Chem., Univ. Edinburgh.]

Pasture, Hay and Silage

264

PETERSON, M. L. and HAGAN, R. M. **Production and quality of irrigated pasture mixtures as influenced by clipping frequency.** *Agronom. J.*, 1953, 45, 283-287. [Dept. Agronom., Univ. California, Davis.]

Four irrigated pasture mixtures were cut at intervals of 2, 3, 4 or 5 weeks over 3 years. Total yields, adjusted to a 12 per cent. moisture basis, increased with the interval between cuttings. The average increase of all mixtures with extension of interval from 2 to 5 weeks was 92 per cent. Percentage increases for ladino and grass, alfalfa and grass, trefoil and grass, and alfalfa and ladino, trefoil and grass mixtures were 43, 177, 90 and 86 respectively. Botanical and chemical analyses were made in the second year. As the cutting interval was extended the proportion of legumes increased, percentage ash, crude protein and ether extract decreased and fibre increased.

It is suggested that mixtures containing ladino clover as the principal legume should be grazed intensively at intervals of 25 to 28 days, but when trefoil or alfalfa is the dominant legume a slightly longer interval should be allowed.—F. C. Aitken.

265

NICHOLSON, H. H., FIRTH, D. H., EDEN, A., ALDERMAN, G., BAKER, C. J. L. and HEIMBERG, M. **The effect of ground water-level**

upon productivity and composition of fenland grass. *J. Agric. Sci.*, 1953, 43, 265-274. [Sch. Agric., Univ. Cambridge.]

For previous work see Abst. 4671, Vol. 21.

The results of the work here reported in general confirmed the conclusions arrived at before. A high water level, about 18 in. below ground level, adversely affected the yield and quality of ryegrass as shown by its protein content. A high water level also depressed the amounts of K and Mg in the grass, but had no consistent effect on Ca and P. P. C. Jowsey.

266

WHISTLER, R. L. and DESZYCK, E. J. **General composition of switchgrass *Panicum virgatum*.** *Arch. Biochem. Biophys.*, 1953, 44, 484-491. [Dept. Agric. Chem., Purdue Univ., Lafayette, Ind.]

267

PIGDEN, W. J. **The relation of lignin, cellulose, protein, starch and ether extract to the "curing" of range grasses.** *Canad. J. Agric. Sci.*, 1953, 33, 364-378. [Exp. Stat., Swift Current, Sask.]

Two native grasses, common speargrass (*Stipa comata*) and rough fescue (*Festuca scabrella*), which "cure" well, were compared with 2 introduced species which do not have this property.

The position and extent of lignification was of greater importance in curing than the total quantity present. No relation was found between protein or starch contents and "curing" ability. P. C. Jowsey.

268

STEWART, A. B. and HOLMES, W. **Manuring of grassland. 1. Some effects of heavy dressings of nitrogen on the mineral composition of grassland herbage.**

RAYMOND, W. F. **2. Use of nitrogen.**

HAMILTON, R. A. **3. Manuring and utilization.** *J. Sci. Food Agric.*, 1953, 4, 401-408; 409-410; 411-414. [Macaulay Inst. Soil Res., Aberdeen.]

1. The results discussed are those obtained from current work, previous reports of which were noted in Absts. 274, 3252, Vol. 19 and 3271, Vol. 21.

Dry matter yield, botanical composition, protein, P, K, Ca, Mg, Na and Mn were estimated in herbage from ryegrass-dominant pasture given heavy dressings of N fertiliser with or without P and K fertilisers.

The results indicated that high yields of herbage with high protein and normal mineral contents can be maintained over a number of years by the application of N, provided that adequate amounts of other major nutrients are given also.

N.A. and R., January 1954

2. Heavy N applications tend to reduce the percentage of clovers in mixed swards, and it is recommended that on the general farm dressings of not more than 4 cwt. Nitro-chalk per acre should be used. Even at this rate the supply of N fertilisers is inadequate to dress more than a small proportion of British grasslands, if allowance is made for the prior demands of other crops such as cereals, potatoes and sugar beet. At present, less than $\frac{1}{2}$ cwt. N fertiliser per acre of grassland is available.

3. Fertiliser dressings for different swards are listed and the effect of time of application is discussed.

The average cost per ton of producing starch equivalent on over 60 farms of different types for which records were kept is given in tabular form.

P. C. Jowsey.

269

BIRCH, H. F. **The relationship in acid soils between base saturation and phosphorus uptake by grasses.** *J. Agric. Sci.*, 1953, **43**, 329-333. [E. African Agric. and Forest. Res. Organiz., Kikuyu, Kenya.]

270

FERGUSON, W. S. and TERRY, R. A. **Purines in grassland herbage.** *Nature*, 1953, **172**, 346-347. [I.C.I., Ltd., Jealott's Hill Res. Stat., Bracknell, Berks.]

The purines adenine, guanine, xanthine and hypoxanthine were almost certainly identified chromatographically in juice from "grassland plants" [species not stated]. They probably exist in the free state but may be formed by the "enzymic breakdown of nucleosides etc."

Tentative chromatographic analysis of another fraction suggested the presence of the pyrimidines thymine and uracil. The work continues.

P. C. Jowsey.

271

DAVIES, R. O., MORGAN, T. B. and DAVIES, W. E. **The yields and composition of lucerne, grass and clover under different systems of management. 1.** *J. Brit. Grassland Soc.*, 1953, **8**, 149-168. [Univ. Coll. Wales, Aberystwyth.]

Alfalfa, grasses and clover were sown in small plots alone and in different combinations. Three cutting managements were used: 4 cuts per season to give a high quality product; 3 cuts as the "normal" management and 2 cuts consisting of hay and aftermath only.

Yields and percentages of dry matter and crude protein and contents of carotene, Ca and P were estimated for each cut. Botanical composition was estimated also. The results are presented in detail.

Maximum dry matter yield was obtained in the

first year by cutting 3 times, but in the second year, from the plots cut only twice in the first season. Similarly, maximum crude protein in the first year was from 3 or 4 cuts, but in the second year from the plots cut twice in the first year. There was no advantage in cutting 4 times in the first season as, apart from the reduction of yields in the second year, the alfalfa plants were exhausted, the stand was weakened and weeds were able to establish themselves more easily.

With alfalfa mixtures, 3 cuts in the first year gave the best results over 2 years, but for long leys it is suggested that 2 cuts only would be the safest management.

Alfalfa alone gave the best results when cut 3 times in each of the 2 years.—P. C. Jowsey.

272

MILLIKAN, C. R. **Relative effects of zinc and copper deficiencies on lucerne and subterranean clover.** *Austral. J. Biol. Sci.*, 1953, **6**, 164-177. [Plant Res. Lab., Dept. Agric., Burnley, Victoria.]

Details and photographs are given of the signs of Zn and Cu deficiencies in plants of subterranean clover var. Dwalganup and of alfalfa var. Hunter River grown in nutrient solution.—P. C. Jowsey.

273

MATHAMS, R. H. and SUTHERLAND, A. K. **The oxalate content of some Queensland pasture plants.** *Queensland J. Agric. Sci.*, 1952, **9**, 317-334. [Chem. Lab., Div. Plant Indust.]

The total and water-soluble oxalate contents of 80 species of pasture plants were estimated. Thirty-four species contained less than 0.5 per cent. total oxalate and 17 species more than 4.0 per cent. Oxalate content was highest in young plants and varied with rainfall and probably also with soil and other environmental factors.

P. C. Jowsey.

274

ASHTON, W. M. and MORGAN, D. E. **The chemical composition and nutritive value of Welsh hay: comparison with other British hays. 2.** *J. Brit. Grassland Soc.*, 1953, **8**, 131-147. [Dept. Agric. Chem., Univ. Coll. Wales, Aberystwyth.]

Ash, Si, Si-free ash, Ca, P, Cl, Mg, Fe, Mn, Cu and Co were estimated in a total of 225 samples of meadow and seeds hays collected from Welsh farms. Individual species were analysed also. The results are presented in detail.

Average values for meadow and seeds hay, respectively, were: ash 6.46, 6.06; Si-free ash 4.79, 4.39; CaO 0.88, 0.93; P₂O₅ 0.50, 0.50; Cl 0.68, 0.68; MgO 0.30, 0.31 per cent.; Fe 135, 119; Mn 122, 88 and Cu 7.4, 6.3 p.p.m., all on a dry matter basis.—P. C. Jowsey.

275

SCHARRER, K., SCHREIBER, R. and KÜHN, H. Über die Zusammenhänge zwischen dem Entwicklungszustand der Luzerne und ihrer Silierfähigkeit. [Stage of growth of lucerne and its suitability for silage.] *Arch. Tierernährung*, 1952, **3**, 160-176. [Agrikulturchem. Inst., Justus Liebig Hochsch., Giessen.]

Alfalfa was cut at 3 stages of growth, before, during and after flowering, and was made into silage with the addition of one of 3 commercial preservatives: crude formic acid, Kofasalt and Glykosil-Streusalz. [The composition of the 2 latter is not given.] The green material was sampled and analysed at each cutting and 300 kg. was put into each silo. The silos were opened and emptied after about 10 weeks and the contents were weighed and analysed. The percentage losses were: organic matter 12 to 13, crude protein 6 to 7, true protein 41 to 50, crude fibre 4 to 9, N-free extract 21 to 25. These figures were not affected in any regular manner by stage of growth at cutting. The use of Kofasalt resulted in much smaller losses of all constituents than when either of the other 2 preservatives was used. The losses of crude and true protein were reflected in a rise in amide N, and there was also a rise in ether extract in the silage with increasing maturity of the original crop. The pH of the silage was below 5 in the first 2 stages of growth with the first 2 preservatives but above 5 with the third, and above 5 at the third stage of growth with all preservatives. Kofasalt gave the best results at all stages of growth and the same was true with respect to ammonia N formation, the relative proportions of lactic and butyric acids in the total volatile acids, and the grading of the silage.—W. Godden.

276

SCHARRER, K., SCHREIBER, R. and KÜHN, H. Silierversuche über die Nährstoffverluste beim Anwelkverfahren. [Silage experiments to test loss of nutrients in the wilting process.] *Arch. Tierernährung*, 1952, **3**, 177-187. [Agrikulturchem. Inst., Justus Liebig Hochsch., Giessen.]

Alfalfa was ensiled in 300 kg. portions, either fresh or after wilting for 24 or 32 hr. In all cases Kofasalt was added as preservative. The silos were opened after 8 months and the contents were weighed and analysed. In general, wilting did not affect the slight losses in the silo and had no marked effect on the quality of the silage, except to raise the pH and increase the percentage of total volatile acids. Butyric acid was absent from all samples and the increase was entirely in lactic acid.—W. Godden.

277

ROBERTSON, H. A. and BARNETT, A. J. G. The breakdown of amino acids in fermentation mixtures of minced kale and water. *Biochem. J.*, 1953, **55**, xx. [Div. Agric. Biochem., Dept. Biol. Chem., Univ. Aberdeen.]

278

BARNETT, A. J. G. and DUNCAN, R. E. B. The formation of volatile fatty acids in laboratory mixtures of minced crops and water, and the occurrence of these acids in field silage. *Biochem. J.*, 1953, **55**, xix-xx. [Div. Agric. Biochem., Dept. Biol. Chem., Univ. Aberdeen.]

See also Absts. 206, 812, 1241, 1246, 1247, 1249.

MISCELLANEOUS

279

Fluorine in food. *J. Roy. Inst. Pub. Health Hyg.*, 1953, **16**, 206.

The Metallic Contaminations Sub-Committee of the Food Standards Committee has recommended the following reduced limits for F: acidic phosphate, 30 p.p.m.; baking powder, 10 p.p.m.; self-raising flour and any similar mixture (not included under baking powder) containing a farinaceous substance and an acidic phosphate, 3 p.p.m. (For text of the report, see *Minist. Food Bull.* No. 705, 6 June 1953.)—W. M. Deans.

280

NÖMMIK, H. Fluorine in Swedish agricultural products, soil and drinking water. *Thesis, Univ. Stockholm*, 1953, pp. 121. [Dept. Food Hyg., Nat. Inst. Pub. Health, Tomtebodavägen, Stockholm.]

The subject is dealt with under the following main headings: methods of F estimation; F in some common foods and crops; relation between the nature of the Quaternary deposits and F in well water, soil and crops; F in soils and F in well water.

Data for the F content of the domestic water supply of most of the urban areas of Sweden showed that 64 per cent. of the total population were consuming water with an F content below 0.20 mg. per litre.—P. C. Jowsey.

281

BERTRAND, G. and SILBERSTEIN, L. Sur la teneur des graines en manganèse. [Manganese content of seeds.] *C.R. Acad. Sci.*, 1953, **237**, 481-482.

Mn was estimated in the seeds of 104 plant species. No detailed results are given, but the average contents of plants of particular families were: *Cruciferae* 25.3, *Papilionaceae* 26.0, *Labiatae* 31.0, other dicotyledonous families 33.2, *Gramineae* 28.9, other monocotyledonous families 77.4 mg. per kg. dry matter.—P. C. Jowsey.

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282

LOBB, W. R. **Progress of molybdenum investigations in North Otago.** *N.Z. J. Agric.*, 1953, **87**, 3-11. [Dept. Agric., Oamaru.]

More than 40 field trials with many different crops in 1952-53 showed that Mo was important in the agricultural economy of North Otago. Lists of plants responding to Mo supplements are given, with illustrations of representative crops, treated and untreated.—P. C. Jowsey.

283

KIERMEIER, F. and CODURO, E. **Über das Vorkommen von Enzymen in Brot.** [Occurrence of enzymes in bread.] *Ztschr. Lebensmittel-Untersuch. Forsch.*, 1953, **96**, 405-409. [Deutsch. Forschungsanst. Lebensmittelchem., Munich.]

Estimations of enzyme activity in different types of bread showed that in some cases amylolytic and proteolytic enzymes could survive the baking process. "Knäckebröt" showed specially high amylolytic activity, and the presence of proteases was demonstrated also. In "Vollkornschrotbröt" (rye wholemeal bread) and "Schlüterbröt" (a wholemeal fine bread) the amylolytic activity was

considerably less than in "Knäckebröt" but still distinctly positive; protease activity was not demonstrable. In breads kept moist for some time during the baking process, e.g., "Pumpernickel" and "Simonsbröt", the enzymes were completely inactivated.—M. B. Richards.

284

LAURENSEN, F. **Über gesundheitliche Bedenken bei der Verwendung von Phosphorsäure und primärem Phosphat in Erfrischungsgetränken.** [Health considerations concerning the use of phosphoric acid and primary phosphate in beverages.] *Ztschr. Lebensmittel-Untersuch. Forsch.*, 1953, **96**, 418-440. [Tuberk.-Forschungsinst., Inst. Exp. Biol. Med., Borstel.] A review.

285

IVERSEN, S. and LAM, J. **Über den Farbstoff in Annatto-Butterfarben.** [The pigment in annatto butter dyes.] *Ztschr. Lebensmittel-Untersuch. Forsch.*, 1953, **97**, 1-7. [Fibiger Lab., Pathol. Anat. Inst., Univ. Copenhagen.]

See also Absts. 627, 628.

3. VITAMINS

GENERAL

286

WILLIAMS, R. R. **Algunos capitulos de la historia de las vitaminas y sus usos.** [Some chapters in the history of vitamins and their use.] *Rev. Asoc. argent. Dietologia*, 1952, **10**, 153-159. [Inst. Nac. Nutrit., Buenos Aires.]

287

BAUMANN, C. A. **Fat-soluble vitamins.** *Annu. Rev. Biochem.*, 1953, **22**, 527-544. [Dept. Biochem., Coll. Agric., Univ. Wisconsin, Madison.]

288

BESSEY, O. A., LOWE, H. J., and SALOMON, L. L. **Water-soluble vitamins.** *Annu. Rev. Biochem.*, 1953, **22**, 545-628. [Dept. Biochem., Univ. Texas Med. Branch, Galveston.]

289

WOOD, E. C. **The efficient planning of microbiological assays.** *Analyst*, 1953, **78**, 451-460 (with discussion 460). [Clarence House, Clarence Rd., Norwich.]

The design of many assays of vitamins and amino-acids for which the relation between response and dose is curvilinear is described and criticised.

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With assays of cobalamin as illustration, it is argued that only a limited section of the response curve is of use and doses outside this range contribute nothing to the determination. It would be wiser to increase the number of doses to ensure that an adequate number do fall in the useful range.

After this general criticism, the lack of precision in such an assay and the general lack of amenability of the result to objective assessment are discussed. The curve for log-response and log-dose is then shown to be linear over a considerable range of dose and to such a relationship statistical analysis is readily applicable.

Efficient designs to use this relationship are then discussed and in a statistical appendix a number of designs are given together with the form of analysis applicable to each.—G. T. Park.

290

SCHOEN, G. **Analisi cromatografica su carta delle vitamine.** [Chromatographic analysis of vitamins on paper.] *Acta vitaminol.*, 1953, **7**, 151-167. [Lab. Ric., Lepetit S.p.A., Milan.] French, English, German and Spanish summaries.

Some account is given of the behaviour in paper chromatography of vitamins A and D, vitamin B₁,

thiochrome, riboflavin, vitamins B₆ and B₁₂, folic acid, nicotinic acid, nicotinamide and pantothenic acid, and their derivatives, also of the tocopherols, ascorbic and dehydroascorbic acid, and vitamin P and substances akin to it. Tables are given in which is collected information about suitable solvents, type of paper, *R_F* value, and method of identifying the spots, with the references, for the various substances. There are also diagrams showing the position of the spots with different solvents.—E. M. Hume.

291

LEE, Y. C. P., KING, J. T. and VISSCHER, M. B. **Strain difference in vitamin E and B₁₂ and certain mineral trace-element requirements for reproduction in A and Z mice.** *Amer. J. Physiol.*, 1953, **173**, 456-458. [Dept. Physiol., Univ. Minnesota, Minneapolis.]

Female mice of the A and Z strains were given at weaning a basal diet of casein, glucose, lard, brewer's yeast, alfalfa meal, cod liver oil, wheat germ oil and salt mixture. Reproductive capacity was measured as the number of young born alive and the number alive at weaning. With the basal diet alone the average number born alive to the A strain mice was 4.7 and the average number alive at weaning was 4.7, and for the Z strain mice the corresponding values were 0.2 and 0. For the Z strain mice the addition of 8 per cent. wheat germ oil to the diet increased the averages to 3.7 and 0.9, respectively. α -Tocopherol in amounts of 8, 16 and 32 mg. per cent. gave averages of 4.3 and 2.8, 5.3 and 2.0, and 5.6 and 2.5. Addition of yeast and alfalfa had no effect. Vitamin B₁₂ as 6 μ g. per cent. gave average values of 6.6 and 1.6 and an animal-protein factor added as 1.5 per cent. gave average values of 4.3 and 0. A change in the composition of the salt mixture also increased both averages.

R. J. Ward.

292

INGLE, D. J., NEZAMIS, J. E. and MORLEY, E. H. **Failure of certain vitamins to affect the survival of the eviscerate rat.** *Proc. Soc. Exp. Biol. Med.*, 1953, **83**, 602-603. [Res. Labs., Upjohn Co., Kalamazoo, Mich.]

Adult male rats were eviscerated by the method described by Ingle (*Exp. Med. Surg.*, 1949, **7**, 34) and received intravenously 0.9 per cent. NaCl, glucose, insulin, streptomycin and penicillin, with or without a mixture of vitamins B₁, B₆, B₁₂, A, D and E, folic acid, riboflavin, pantothenate and nicotinamide. There were no differences in survival times between the groups. Preliminary tests with the mitochondria fraction of rat liver extracts to provide co-enzymes of the vitamins and with several extracts of beef liver were negative also.—V. R. Jackson.

293

DE BARBIERI, A. and GERRA, A. **Eliminazione per via renale di vitamine nell'ipercorticalismo da ACTH. [Excretion of vitamins through the kidneys in a state of cortical excess caused by adrenocorticotrophic hormone.]** 1. Ricerche sulla tiamina, la riboflavina, la niacina e l'acido pantotenico. [1. Vitamin B₁, riboflavin, nicotinic acid and pantothenic acid.] 2. Ricerche sulla piridossina, la cianocobalamina e l'acido ascorbico. [2. Pyridoxine, cyanocobalamin and ascorbic acid.] *Boll. Soc. ital. Biol. sper.*, 1953, **29**, 127-129; 129-131. [Lab. Biochim., Ist. Sieroterap., Milan.]

1. Urine was collected from rats of about 120 g. weight, fed on a complete diet. For a preliminary period of 15 days the animals were given a daily injection of saline, after which 0.5 unit adrenocorticotrophic hormone was injected twice daily for 10 days. Ascorbic acid and the B vitamins were estimated in the urine. The daily amounts excreted, in μ g., before and during administration of the hormone, respectively, were riboflavin 108.6 and 93.4, nicotinic acid 239.3 and 130.8, and pantothenic acid 725.5 and 861.9.

2. In the same way values were obtained for vitamin B₆ 127.6 and 97.3 μ g., ascorbic acid 1450 and 983 μ g. and vitamin B₁₂ 493.5 and 182.1 μ g. Except for pantothenic acid, the excretion of all the vitamins estimated was decreased by hormone administration.—E. M. Hume.

294

BOSCOTT, R. J. and GREENBERG, S. M. **The effect of dietary deficiencies, aminopterin, ascorbic acid, chloretone, and antibiotics, on the urinary excretion of phenolic acids in the rat.** *Biochem. J.*, 1953, **55**, xviii. [Dept. Anat., Univ. Birmingham.]

295

USUELLI, F. and PIANA, G. **Fattori alimentari e genetici nella profilassi delle malattie infettive.** 4.5. [Dietary and genetic factors in the prevention of infective diseases. 4.5.] *Riv. Zootec.*, 1953, **26**, 165-168; 202-207.

For previous sections, see Abst. 5352, Vol. 23.

4. The possible effect is reviewed of vitamin E and of vitamin K on resistance to *Brucella* infection in farm animals. Certain work on guinea pigs with *Brucella abortus* by the authors' colleague, Dr. Curto [apparently unpublished, since no reference is given] is quoted. His results are considered to show that treatment with vitamin E favourably influences the degree of resistance to the infection but does not offer an effective means of prophylaxis.—E. M. Hume.

5. Deficiency of the vitamin B complex is discussed in relation to resistance to infection.

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The importance of the vitamin B complex in protein metabolism and in the formation of antibodies is considered.—T. D. Bell.

296

VELTRE, F. A., SHORB, M. S. and PELCZAR, M. J. (Jr.) **Nutritional requirements of *Lactobacillus bifidus* isolated from poults and chicks.** *Proc. Soc. Exp. Biol. Med.*, 1953, **83**, 284–286. [Dept. Poultry Husb., Univ. Maryland, College Park.]

Strains of *Lactobacillus bifidus* from the caecum of turkeys and chickens were maintained with monthly transfer on a medium containing papaic digest of soya bean. None would grow in the purified medium containing 25 mg. Na acetate per ml. which supported *L. bifidus* of human origin. When the medium was diluted, growth occurred

only in the presence of the soya bean digest or other crude substance such as yeast extract, beef extract or fish solubles. Several vitamins and other compounds were tested, but the requirements of the avian strains appeared to differ from those of the human strain. The avian strains did not lose their branched structure after from 1 to 2 years in culture, nor did they become aerobic, but they could be grown aerobically in presence of ascorbic acid.—V. R. Jackson.

297

LITSKY, W., ESSELEN, W. B. (Jr.), TEPPER, B. S. and MILLER, G. **Nutritive requirements of *Acetobacter*. 1. Vitamin requirements of *Acetobacter xylinum*.** *Food Res.*, 1953, **18**, 250–252. [Massachusetts Agric. Exp. Stat., Amherst.]

VITAMIN A

298

MURRAY, T. K. and CAMPBELL, J. A. **A comparison of physical and chemical methods with biological assay of vitamin A.** *J. Pharm.*, 1953, **5**, 596–607. [Food and Drug Labs., Dept. Nat. Health, Ottawa.]

The procedure of Morton and Stubbs applied to the estimation of vitamin A gave a more accurate assessment of the biological potency of market samples of fish liver oils than that given by the SbCl_3 method or by uncorrected spectrophotometric measurements. It gave also the best estimate of the biological potency of a partially oxidised cod liver oil. Application of the correction distinguished between halibut liver oils and concentrates on the one hand and cod liver oils on the other. With the former the correction gave similar results for oils and for the unsaponifiable fraction, with the latter it gave higher results for the oils. The practice of multiplying uncorrected E values by 1600 did not indicate accurately the vitamin A content of cod liver oils or concentrates, giving usually too high a value, but appeared to be satisfactory for halibut liver oils. The potency of neovitamin A was found to be 72 per cent. of that of all-*trans* vitamin A when estimated biologically by the vaginal-smear method.

K. H. Coward.

299

MOOR, H. **Die Bestimmung von Vitamin A in Lebens- und Futtermitteln.** (Auswertung nach Carr-Price.) **[Estimation of vitamin A in foods and feedingstuffs. (Carr Price method.)]** *Mitt. Geb. Lebensmittel. Hyg.*, 1953, **44**, 257–264. [Hoffmann-La Roche Co., Basle.] French and English summaries.

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The material under examination was homogenised and extracted with ether. Arachis oil was added if the yield of fat was only small, and saponification was effected with alcoholic NaOH in presence of hydroquinone. The soaps were concentrated by partial evaporation of the solvent and then mixed with alumina. The vitamin fraction was extracted with ether, and the SbCl_3 reagent was applied, with or without further purification by chromatography on alumina weakened with 12 per cent. of water, according to the material. The loss of added vitamin A submitted to the processes for saponification and chromatography never exceeded 7 per cent. An accuracy of ± 3 to 6 per cent. is claimed. For milk, ammonia was used for the preliminary extraction, according to the Röse Gottlieb method.

T. Moore.

300

FUJITA, A. and AOYAMA, M. **Free and esterified vitamin A in fish oils; chromatographic separation and colorimetric determination.**

Colorimetric and fluorometric determination of vitamin A in fish liver oils; chromatographic separation of vitamin A and non-vitamin A materials in the unsaponifiable matter. *J. Biochem., Tokyo*, 1953, **40**, 151–156; 157–168. [Biochem. Lab., Kitasato Inst., Tokyo.]

The authors' methods are fully described (see also Absts. 235 and 2822, Vol. 23). Some values obtained by the two methods are given for fish liver oils.—E. M. Hume.

301

AVAMPATO, J. E. and EATON, H. D. **Comparison of methods for the estimation of vitamin A in**

calf plasma. *J. Dairy Sci.*, 1953, **36**, 783-793. [Dept. Animal Indust., Univ. Connecticut, Storrs.]

Specimens of calf plasma containing low and high amounts of carotenoids were extracted by a modification of Kimble's method and subjected to 4 different treatments: saponification without separation of carotene and vitamin A; saponification followed by separation of carotene by precipitation and by chromatography on alumina; the same two treatments without saponification. Vitamin A was estimated by the SbCl_3 reaction in an Evelyn photo-electric colorimeter, by the glycerol dichlorohydrin method and a Coleman Model 14 spectrophotometer, and by ultraviolet absorption at 325 $\mu\mu$. with the Beckman Model D.U. spectrophotometer. Carotenoids were estimated at 440 $\mu\mu$. with each of the instruments. Values for carotene obtained with the Evelyn colorimeter were less than with the other instruments. Saponification without separation had little effect on the carotene values, but the values obtained by both methods of separation without saponification were lower, and were still lower when the plasma was saponified as well.

Both colorimetric methods for vitamin A gave lower total values than ultraviolet absorption. The SbCl_3 method gave higher values than the glycerol dichlorohydrin method for the plasma with a high carotene content. Separation had little effect on the total vitamin A content, but separation of carotene was more efficient for non-saponified samples by the precipitation method and for saponified samples by the chromatography method.—R. J. Ward.

302

CALLISON, E. C., HALLMAN, L. F., MARTIN, W. F. and ORENT-KEILES, E. (with CONWAY, E. S. and CRUMP, E.) **Comparison of chemical analysis and bio-assay as measures of vitamin A value: yellow corn meal.** *J. Nutrition*, 1953, **50**, 85-100. [Bur. Human Nutrit., Agric. Res. Admin., U.S. Dept. Agric., Washington, D.C.]

The carotenoid pigments from a specimen of yellow maize meal were extracted, separated chromatographically and studied spectrophotometrically. The vitamin-A-active carotenoids present included, in μg . per 100 g. meal, cryptoxanthin 236.6, all-*trans*- β -carotene 31.1, *neo*- β -carotene B 39.6 and *neo*- β -carotene U 21.5. A considerable quantity of another pigment, probably ζ -carotene, was present which, with lutein, zeaxanthin and other pigments of no vitamin A value, was excluded from the calculations. The sum of the biological potencies of the 4 active carotenoids was calculated to be 317 I.U. per 100 g. An extract was prepared from the same meal with fat solvents

and saponified; the unsaponifiable portion was dissolved in cottonseed oil, and the potency of the oily solution was estimated by rat growth against β -carotene. In terms of the original meal the activity was 324 I.U. per 100 g., which confirms the value of 317 obtained by calculation. The biological potency of the whole meal for rats was 264 I.U. per 100 g. The availability of the carotenoids in the whole meal was, therefore, 82 per cent. It is suggested that the lower availability reported by others may be due to the inclusion in the chemical estimation of biologically inactive pigments.

V. H. Booth.

303

STROSS, P. and STUCKEY, R. E. **An adsorption method for the measurement of vitamin A stability.** *J. Pharm.*, 1953, **5**, 547-549. [British Drug Houses, Ltd., London.]

The stability of oils containing vitamin A when present in tablets or when adsorbed on solids was estimated at temperatures of 25° and 37° C. in preference to the higher temperatures usually employed, which are liable to cause thermal decomposition. Ca phosphate, Kieselguhr, Ba sulphate and silica were tried as adsorbents. Ca phosphate B.P. was the most suitable, as it gave even distribution of the oil, moderate speed of decomposition and ease of extraction.

K. H. Coward.

304

WALLCAVE, L., LEEMANN, J. and ZECHMEISTER, L. **Action of boron trifluoride etherate on β -carotene.** *Proc. Nat. Acad. Sci., Washington*, 1953, **39**, 604-606. [Gates and Crellin Labs. Chem., California Inst. Technol., Pasadena.]

305

SAVINOV, B. G. and MIHAILOVNINA, A. A. [*Neo*- β -carotene B as a product of the first stereoisomeric conversion of β -carotene on heating.] *Dokl. Akad. Nauk S.S.S.R.*, 1953, **88**, 887.

306

PORTER, J. W. **Relationships between physical properties and structure of carotenes and colourless polyenes.** *Arch. Biochem. Biophys.*, 1953, **45**, 291-300. [Purdue Univ., Lafayette, Ind.]

307

RABOURN, W. J. and QUACKENBUSH, F. W. **The occurrence of phytoene in various plant materials.** *Arch. Biochem. Biophys.*, 1953, **44**, 159-164. [Dept. Agric. Chem., Purdue Univ., Lafayette, Ind.]

It has been suggested that phytoene is a precursor of carotene. A method for its estimation, and its distribution in a number of ordinary food plants and fruits, are described.—V. R. Jackson.

N.A. and R., January 1954

308

FISHER, L. R., KON, S. K. and THOMPSON, S. Y.
Vitamin A and carotenoids in certain invertebrates. 1. Marine crustacea. *J. Marine Biol. Assoc.*, 1952, **31**, 229-258. [Nat. Inst. Res. Dairying, Shinfield, Reading.]

Specimens of plankton were collected in Loch Fyne, the Faeroe and Shetland area, and off the coast of Norway. Krill (euphausiids) was obtained from whales in arctic and antarctic waters, and littoral and benthic animals were collected from Loch Fyne and the Essex coast. Samples were analysed for vitamin A, total carotenoids and β -carotene. Extracts were saponified directly and then subjected to chromatography on aluminium oxide or were submitted to direct chromatography, to separate vitamin A ester and alcohol. Vitamin A was estimated by chemical, physical and biological tests, and carotenoids by their natural colour. Free-swimming arctic krill contained from 288 to 835 I.U. vitamin A per g. oil. No carotene was present but there were large amounts of astaxanthin. In krill recovered from the stomachs of arctic whales smaller concentrations of vitamin A were found, ranging from 188 to 392 I.U. per g. oil. In *Meganyctiphanes norvegica* the vitamin A content increased with the size of the animal from 455 I.U. per g. oil when 17 mm. long to 1120 I.U. when 39 mm. long. No such change was found in specimens of *Thysanoessa raschii*. In both species, however, the content of astaxanthin rose with the size of the animal. Of the total vitamin A in the euphausiids examined, 92 to 98 per cent. was in the eyes, and the remainder was in the exoskeleton and contents of the cephalothorax. Most of the astaxanthin also was present in the eyes. The function of astaxanthin in the *Crustacea* is discussed. Vitamin A concentration was much less in decapods because less was present in the eyes. No vitamin A was found in the amphipods, isopods and cladocera examined. Biological tests of the oils on rats showed only about half the activity indicated by chemical and physical tests. The high content of vitamin A in euphausiids which supply the main food of whales is sufficient to account for the rich stores found in whale liver.—I. M. Sharman.

309

PINCKARD, J. H., KITTREDGE, J. S., FOX, D. L., HAXO, F. T. and ZECHMEISTER, L. **Pigments from a marine "red water" population of the dinoflagellate *Prorocentrum micans*.** *Arch. Biochem. Biophys.*, 1953, **44**, 189-199. [Gates and Crellin Labs., California Inst. Technol., Pasadena.]

During an occurrence of red water in the sea off the Pacific coast, samples consisting almost entirely of the brownish dinoflagellate, *Prorocen-*

trum micans, were taken and analysed. The main carotenoid was peridinin, but small amounts of epiphasic carotenoids, chiefly β -carotene, were present.—E. M. Hume.

310

RUSHTON, W. A. H. **The measurement of rhodopsin in the living eye.** *Acta physiol. scand.*, 1953, **29**, 16-18. [Cambridge.]

Rhodopsin was estimated in the eye of the living albino rabbit with the rhodopsinometer previously described by the author (*J. Physiol.*, 1952, **117**, 47). The eye was light-adapted, and measurements were made over an hour with green light focused on the retina and the reflected light received on a photocell.

The optical density of the retina measured in red light did not change with accumulation of rhodopsin, and remained fairly constant. The density in violet light also was nearly constant, being independent of rhodopsin but dependent on the blood content of the retina. The density in blue-green light, which estimated the amount of rhodopsin, increased at a constant rate. Strong light, 10^6 times the human threshold, bleached the rhodopsin quickly. The total density which accumulated was attained and maintained at an illumination 10^5 times the human threshold, and represented absorption of 35 per cent. of the incident light on a single passage through the retina.

V. R. Jackson.

311

POWELL, L. T. and KRAUSE, R. F. **Vitamin A distribution in the rat liver cell.** *Arch. Biochem. Biophys.*, 1953, **44**, 102-106. [Dept. Biochem., Sch. Med., W. Virginia Univ., Morgantown.]

Rats were given a normal diet for 2 weeks with and without a daily supplement of from 6200 to 7500 I.U. vitamin A given orally for the second week. At the end of the 2 weeks the animals were killed and their livers were removed, weighed, chilled in cold 0.25 M sucrose and frozen at -20°C . When required, the livers were thawed and forced through a tissue mincer which allowed only free cells to pass. A weighed quantity was homogenised in 0.25 M sucrose, diluted to 15 ml., and 10 ml. were taken for preparation of the cytoplasmic fractions, which were designated nuclei, mitochondria and fraction X. Total N and vitamin A content were estimated in each fraction. Vitamin A was present in all fractions from normal and supplemented animals. The concentration was highest in fraction X in both, lowest in the nuclei from normal animals and in the mitochondria from supplemented animals. In the nuclear fraction, on supplementation, the average content of vitamin A increased 345 per cent. above

the average normal, while with mitochondria and fraction X the increase was 230 and 141 per cent., respectively.—R. J. Ward.

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KRAUSE, R. F. and POWELL, L. T. **The *in vitro* hydrolysis and esterification of vitamin A.** *Arch. Biochem. Biophys.*, 1953, **44**, 57–62. [Dept. Biochem., Sch. Med., W. Virginia Univ., Morgantown.]

Rat liver homogenates were separated into mitochondria, nuclei and fraction X and each fraction was suspended in 0.25 *M* sucrose. Intestine and kidney homogenates also were suspended in 0.25 *M* sucrose. Each suspension contained 200 mg. tissue per ml. Aqueous dispersions of natural vitamin A esters, vitamin A palmitate, acetate and alcohol were incubated with an equal quantity of suspension and 10 times the amount of veronal buffer for 3 hours at 37° C. The amount of the vitamin in alcohol and ester form was estimated before and after incubation. The only increase in the content of the alcohol occurred with the acetate; a percentage increase of 506 was obtained with a whole liver homogenate, of 670 with nuclei, of 428 with mitochondria, and of 509 with fraction X; the respective percentage decreases in the amount of ester were 37.6, 43.8, 37.8 and 21.8. When the palmitate was incubated with fraction X, no decrease in ester occurred, but there was a percentage decrease of 12.1 with whole liver homogenate, of 15.7 with nuclei and of 37.8 with mitochondria. With the two specimens of natural esters the percentage decrease in ester in the 4 suspensions ranged from 2.7 to 11.8.

On incubation of vitamin A alcohol with liver homogenates no increase in ester form occurred, but with intestine and kidney homogenates the increase was 186 and 100 per cent.—R. J. Ward.

313

GANGULY, J. and DEUEL, H. J. (Jr.) **Intracellular distribution of vitamin A esterase activity in rat liver.** *Nature*, 1953, **172**, 120–121. [Dept. Biochem. Nutrit., Univ. S. California, Los Angeles.]

Male rats, reared on a diet without vitamin A and given 15 to 20 I.U. vitamin A weekly, were killed by heart puncture under light nembutal anaesthesia. The liver, freed from residual blood, was homogenised in 0.25 *M* sucrose solution and the homogenate was fractionated by differential centrifuging. All fractions were diluted so that each contained 200 mg. of original tissue per ml. Crystalline vitamin A acetate was freed from vitamin A alcohol by chromatography, and dispersed in water. It was incubated with the fractions and extracted by the method of McGugan and Laughland (Abst. 1798, Vol. 22); the free

alcohol and ester were estimated by the method of Ganguly *et al.* (Abst. 256, Vol. 23). Preliminary experiments indicated that the esterase activity was concentrated in the microsomal fraction only, the chondrial and supernatant fractions being inactive.—R. J. Ward.

314

ROSENBERG, A. and SOBEL, A. E. ***In vitro* conversion of carotene to vitamin A in the isolated small intestine of the rat.** *Arch. Biochem. Biophys.*, 1953, **44**, 320–325. [Dept. Biochem., Jewish Hosp., Brooklyn, N.Y.]

An aqueous dispersion of carotene containing α -tocopherol was prepared and 0.5 ml. portions, providing 150 μ g. carotene, were introduced by tube into the stomachs of rats deficient in vitamin A. The animals were killed immediately and the contents of the stomach were squeezed into the small intestine which was tied with surgical silk thread and incubated for 2 hr. in Ringer solution at 45° C. The intestinal contents were then flushed out and the gut tissue was examined for vitamin A by measurement of the spectral absorption of the non-saponifiable lipid at 328 $m\mu$. before and after destructive irradiation. It is claimed that the method accurately estimated vitamin A because the curve resulting from the difference in the absorption spectrum between 310 and 390 $m\mu$. before and after irradiation closely resembled the absorption curve of pure vitamin A. In the walls of the small intestine of 10 animals an average of 4.24 μ g. vitamin A was found with a standard deviation of ± 1.53 and a standard error of the mean of 0.39. It is concluded that the small intestine is an important site of conversion of carotene to vitamin A in the rat.—I. M. Sharman.

315

ROSENBERG, A. and SOBEL, A. E. ***In vitro* conversion of carotene to vitamin A in alloxan diabetes.** *Arch. Biochem. Biophys.*, 1953, **44**, 326–329. [Dept. Biochem., Jewish Hosp., Brooklyn, N.Y.]

Rats deficient in vitamin A were divided equally into 2 groups. Diabetes was produced in one group by subcutaneous injection of alloxan, and the other was untreated. An aqueous dispersion of carotene and tocopherol was administered to each animal. The intestine was removed and after incubation carotene and vitamin A were estimated in the intestinal walls. The mean amount of vitamin A produced in the intestinal loops of 10 non-diabetic animals was 4.24 μ g. with a standard deviation of ± 1.53 ; the mean for 10 diabetic animals was only 0.76 μ g., S.D. ± 0.50 . It is concluded that in alloxan-diabetic rats the mechanism by which carotene is converted into

vitamin A is impaired, and that the small storage of vitamin A in the livers of such rats when given carotene is probably due to the impairment.

I. M. Sharman.

316

SOBEL, A. E., ROSENBERG, A. and ADELSON, H. **In vivo conversion of carotene to vitamin A in alloxan diabetes.** *Arch. Biochem. Biophys.*, 1953, **44**, 176-180. [Dept. Biochem., Jewish Hosp., Brooklyn, N.Y.]

Albino rats were fed on a diet deficient in vitamin A until they became depleted. Most of them were then injected subcutaneously with 20 mg. alloxan monohydrate, and the remainder were kept untreated. All were given 2000 μ g. carotene 24 hr. later and, after a further 36 hr., were killed and their blood and livers were analysed for vitamin A. The nondiabetic rats stored an average of 88 μ g. vitamin A in their livers, the diabetic animals only 22 μ g. The difference was shown not to be caused by loss of storage ability or by abdominal destruction of vitamin A because, when similar rats were given 1000 μ g. preformed vitamin A, the diabetic animals stored 90 μ g. in the liver and the nondiabetic ones 123 μ g., a difference which was not statistically significant. The results are considered to indicate an impairment in the alloxan-diabetic rat of the system responsible for the conversion of carotene to vitamin A.

I. M. Sharman.

317

HEBERT, J. W. and MORGAN, A. F. **The influence of alpha-tocopherol upon the utilization of carotene and vitamin A.** *J. Nutrition*, 1953, **50**, 175-190. [Dept. Home Econ., Univ. California, Berkeley.]

Weanling male rats, usually in groups of 10, were fed on a diet lacking vitamins A and E. After 2 weeks, when they were partially depleted of the vitamins, the animals were given daily for 14 days, a few for 28 days, carotene in oil, 24 to 174 μ g., or vitamin A in oil, 35 to 129 μ g., with or without a daily supplement of 0.5 mg. α -tocopherol. After the prescribed interval of treatment the animals were killed 3 hr. after the last dose, and the vitamin A content of the serum, liver and intestinal tissues was estimated. In none of the experiments with the above doses of carotene in oil was any vitamin A found in the intestinal walls.

When vitamin A was given no difference in growth or in serum or liver content of vitamin A could be ascribed to the supplement of tocopherol, except with the lowest dose of vitamin A, 35 μ g., when, after 28 days, an average of 64 μ g. vitamin A was found in the liver of those animals given tocopherol and only 27 μ g. in those not given tocopherol. When carotene was given in the higher doses, somewhat greater stores of vitamin A were

found in the livers of those animals which received tocopherol also. The groups given carotene for 4 weeks instead of 2 showed the effect more clearly, possibly because the growth rate and utilisation of vitamin A had been slightly reduced in the later part of the period. In a further experiment the dose of tocopherol was 1.0 mg. as well as 0.5; the animals were killed 24 hr. after the last dose and the kidneys, in addition to the liver, were analysed for vitamin A. No significant difference was found between the amount of vitamin A in the liver and kidneys of the groups without tocopherol or given 0.5 or 1.0 mg. tocopherol when 43 or 86 μ g. carotene were given daily for 14 days. When aqueous dispersions with Tween 80 of carotene were given to rats the store of vitamin A in the liver was reduced by giving 0.5 mg. tocopherol orally or intraperitoneally. In still further experiments, single doses of 390 μ g. aqueous carotene were given to depleted animals and it was found that vitamin A appeared in the intestinal wall after 30 min., that the amount increased up to one hour and was maintained up to 2½ hr. but had all disappeared after 3 hr. Vitamin A appeared in the liver after 1½ hr. and increased in amount up to the end of the experiment after 3 hr.

I. M. Sharman.

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HIGH, E. G. and WILSON, S. S. **Effects of vitamin B₁₂ on the utilization of carotene and vitamin A by the rat.** *J. Nutrition*, 1953, **50**, 203-212. [Lab. Biochem. Res., Prairie View Agric. and Mech. Coll., Tex.]

Young rats were depleted of vitamins A and B₁₂ and then given daily supplements of 38 μ g. carotene in cottonseed oil for 21 days. In addition, every other day, one group received an intramuscular injection of 0.2 ml. saline, and the other group received 0.2 ml. saline containing 0.28 μ g. vitamin B₁₂ as Cobione, Normocytin or liver extract. The rats which received vitamin B₁₂ grew about 50 per cent. more than those which did not, and the deposition in the liver of vitamin A from the carotene given was 37 per cent. greater. When sulphasuxidine was added to the diet during the depletion period to inhibit microbial synthesis of vitamin B₁₂, the average superiority in growth of those given vitamin B₁₂ was 62 per cent., and liver deposition rose from 36.6 μ g. to 57.0 μ g. Addition of an animal-protein factor supplement to supply 55 μ g. vitamin B₁₂ per kg. diet resulted in a 12 per cent. superiority in weight over a group not given vitamin B₁₂, and storage of vitamin A in the liver increased from 39.7 to 49.9 μ g. When 33 μ g. vitamin A was administered in the same way, instead of 38 μ g. carotene, growth was increased but liver deposition was hardly affected.—R. J. Ward.

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HARTSOOK, E. W., BATCHELOR, E. and JOHNSON, B.C.

Effect of aureomycin on utilization of vitamin A in the growing male albino rat. *Proc. Soc. Exp. Biol. Med.*, 1953, **83**, 43-45. [Div. Animal Nutrit., Univ. Illinois, Urbana.]

Groups of male rats were given a diet deficient in vitamin A alone, or with 0.75 or 7.5 μ g. vitamin A daily with or without 100 mg. aureomycin, per kg. diet. The average weight gains of the 3 groups without aureomycin were 75.6, 198.5 and 251.6 g. and with aureomycin 66.9, 180.2 and 252.9 g., respectively. The typical syndrome of vitamin A deficiency developed in the groups receiving no vitamin A, and the signs appeared earlier in those receiving aureomycin. Storage of vitamin A occurred only in the rats receiving 7.5 μ g. daily of vitamin A. The average vitamin A content of the kidneys and livers of rats receiving vitamin A without aureomycin was 3.7 μ g. total and 2.2 μ g. per g., and 75.9 μ g. total and 7.8 μ g. per g., respectively, compared with 1.5 μ g. total and 0.9 μ g. per g., and 79.6 μ g. total and 6.5 μ g. per g. for those receiving both vitamin A and aureomycin.—R. J. Ward.

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ASCHAFFENBURG, R., BARTLETT, S., KON, S. K., ROY, J. H. B., SEARS, H. J., THOMPSON, S. Y., INGRAM, P. L., LOVELL, R. and WOOD, P. C. **The nutritive value of colostrum for the calf. 9. The effect of soya-bean lecithin on the vitamin A absorption and on the growth rate of calves given small quantities of separated colostrum.** *Brit. J. Nutrition*, 1953, **7**, 275-285. [Nat. Inst. Res. Dairying, Univ. Reading.]

In two experiments, one in autumn and one in spring, calves were reared on a basal synthetic milk diet with and without colostrum, lecithin and vitamin A. All the calves receiving the basal ration alone died in from 3 to 5 days. Of the 62 calves given colostrum, 8 died in from 5 to 13 days. Administration of vitamin A with or without lecithin had no effect on scouring or on the growth rate. Lecithin supplementation had no effect on the plasma levels of vitamin A. In the first of the two experiments, but not in the second, lecithin significantly increased the vitamin A content of the liver of calves which received 80,000 I.U. vitamin A from about 8000 to about 15,000 I.U.—R. J. Ward.

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LE GALLIC, P. **Structure des protéines et activité vitaminique A manifestée par les protéines en présence de saindoux ou de distillat de saindoux.** [Structure of proteins and vitamin A

activity of proteins in the presence of lard or lard distillate.] *C.R. Soc. Biol.*, 1953, **147**, 302-306. [Lab. Physiol. Nutrit., École Hautes-Études, Paris.]

Young rats were depleted of vitamin A with a diet of casein, wheat starch, dried yeast, vitamin D₂ and minerals. The casein was purified by extraction with aqueous acetone, followed by pure acetone and by ether. Groups were then given diets containing the same casein or peptone made from it, with 21.5 per cent. of lard or 6 or 12 per cent. of lard distillate to replace some of the starch. The animals kept on the original diet, or given lard or lard distillate with peptone, died in from 4 to 10 days. The animals given the lard or distillate with casein survived for from 20 to 50 days. No vitamin A was detected in the lard or distillate by the SbCl₃ test. A combination of casein and lard distillate prolonged growth even when the casein had been purified by anionic detergents. The vitamin A activity of lard distillate was, thus, shown only in the presence of casein. The phenomenon appeared to depend on the establishment of a nutritive equilibrium, as first postulated by Randoin and Netter (*Abst.* 1105, Vol. 4).—T. Moore.

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RASANOV, A. S. and TEREKULOVA, S. A. **[Role of proteins in regulation of carotene metabolism.]** *Trudy Vses. Obsch. Fiziol., Biokhim. Farmakol.*, 1952, No. 1, 111.

323

HALL, W. T. K. and HARVEY, J. M. **Effects of methyl-thiouracil on liver vitamin A, spermatogenesis and calcium metabolism of Merino rams.** *Queensland J. Agric. Sci.*, 1952, **9**, 301-316. [Animal Health Stat., Yeerongpilly.]

Groups of 6 Merino rams aged from 18 to 24 months were fed on a basal ration low in carotene, made up of oat chaff and linseed meal. One group received the basal ration only, another was given additional carotene and 2 further groups received daily 2 g. 4-methylthiouracil, one with and one without carotene. After 100 days the animals were killed and the weight of the thyroid gland and testes, serum Ca and liver vitamin A were measured. The mean weight of the thyroids, 16.5 g., of the animals receiving thiouracil was over four times that of the thyroids from the animals without. Serum Ca of those not receiving thiouracil was somewhat less, range 4.0 to 10.6 mg. per 100 ml., than of those in the other groups, range 7.2 to 11.0 mg. per 100 ml. Liver vitamin A varied from 55 to 190 μ g. per g. within the groups, but no difference was found between groups, which suggested that the hypothyroid state, shown by enlarged thyroids and lethargy, had not

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prevented conversion of carotene to vitamin A. The extent of the hypothyroidism was, moreover, more severe than that likely to be brought about in the field by starvation or climatic conditions. Semen, collected at 3-week intervals during the feeding period, showed no difference between the groups.—I. M. Sharman.

324

TEICHMAN, R., ROUSSEAU, J. E. (Jr.), EATON, H. D. and BEALL, G. **Estimation of vitamin A depletion time in young dairy calves.** *J. Dairy Sci.*, 1953, **36**, 591. *Proc.* [Univ. Connecticut, Storrs.]

325

HELMBOLDT, C. F., JUNGHERR, E. L., EATON, H. D. and MOORE, L. A. **The pathology of experimental hypovitaminosis A in young dairy animals.** *Amer. J. Vet. Res.*, 1953, **14**, 343-354. [Dept. Animal Dis., Storrs Agric. Exp. Stat., Univ. Connecticut.]

Calves were reared on a diet of whole milk, dried calf starter and hay until they were 63 or 105 days old. They were then restricted to a diet deficient in vitamin A, mainly of grain mixture and sugar beet pulp. Some of the calves were given supplements of about 100,000 I.U. vitamin A daily. Others were kept on the deficient diet until the value for vitamin A in the blood plasma had fallen to 4 μ g. per 100 ml. or less. Some were killed without treatment 2 or 7 weeks later, at ages of from 105 to 177 days. Others were given daily for 6 days, subcutaneously or orally, an aqueous dispersion of β -carotene at the rate of 120 μ g. per lb. bodyweight, and were killed 14 days later. Further groups were killed after 14 days' treatment with 200,000 I.U. vitamin A daily, or 14 days after they had been given daily injections of 2 g. ascorbic acid for 6 days. In calves untreated, or in which treatment was insufficient, diarrhoea and inco-ordination were consistently found. The spinal fluid pressure was increased. Histological examination revealed squamous metaplasia of the interlobular and main ducts of the parotid gland in all but one animal; the lesion may be considered pathognomonic. Focal necrotic hepatitis was less frequent, but occurred only in deficient animals. A cystic pituitary gland was found in one of the deficient calves and in none of the controls. In the animals treated for 2 weeks with vitamin A the epithelium of the parotid glands was partially restored, and after 4 weeks the cure was complete. Spinal fluid pressure was reduced, and the signs of vitamin A deficiency disappeared. Carotene cured the diarrhoea and inco-ordination, but did not reverse the changes in the parotid glands. Ascorbic acid had no curative effect.—T. Moore.

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HOEKSTRA, W. G., HALL, R. E. and PHILLIPS, P. H. **A study on the relationship of vitamin A to the development of hyperkeratosis (X-disease) in calves.** *J. Dairy Sci.*, 1953, **36**, 601. *Proc.* [Univ. Wisconsin, Madison.]

327

BAUME, L. J. and FRANDSEN, A. M. **Phase contrast microscope study of oral epithelium of normal and vitamin A-deficient rats.** *Proc. Soc. Exp. Biol. Med.*, 1953, **83**, 356-360. [George Williams Hooper Found., Coll. Dent., Univ. California.]

Specimens, described as "briefly formalin-fixed", of the gingival papilla situated between the upper incisors from normal rats and from rats deficient in vitamin A were frozen, sectioned and examined in a suspension of saline. Photomicrographs were taken by the phase contrast technique immediately after sectioning. Sections from 4 rats which had survived for 86 days on a diet deficient in vitamin A differed from the normal in showing aplasia of the basement membrane, causing lack of a distinct border between epithelium and connective tissue, precocious granular involution of the tonofibrils in the stratum spinosum, and parakeratosis of the surface layer.—I. M. Sharman.

328

MOURIQUAND, G., ROLLET, J. and EDEL, V. **Sur les conditions d'apparition des manifestations oculaires de l'avitaminose A du pigeon. [Conditions producing ocular manifestations of vitamin A deficiency in the pigeon.]** *C.R. Soc. Biol.*, 1953, **147**, 706-708.

Pigeons kept on a diet of polished rice supplemented with vitamin B₁ for from 70 to 300 days developed eye lesions due to deficiency of vitamin A. The eyes became dull with encrusted lids, and the feathers were lost from the area round the eyes. The lesions could be cured by giving vitamin A in various forms.—T. Moore.

329

PICCIONI, M. **Sulla azione protettiva della vitamina E nella avitaminosi sperimentale A del ratto. [Protective action of vitamin E in experimental vitamin A deficiency in the rat.]** *Quad. Nutrizione*, 1952, **12**, 403-413. [Ist. Chim. Biol., Univ. Bologna.]

When rats were deprived of vitamin A from 15 days old and were weaned at 25 days, 90 per cent. of them showed signs of vitamin A deficiency within another 20 to 25 days. With their offspring reared in the same way, vitamin E was administered orally to the mother from mating to weaning of the young but not directly to the young, or

orally directly to the young from the 15th to the 30th day of age, without effect on the course of depletion. In curative tests with 1.5 I.U. vitamin A daily, recovery from signs of deficiency and rate of growth were more rapid when vitamin E was given as well. It is concluded that such an effect of vitamin E *in vivo* was of the same nature as the protective effect exercised by it over vitamin A *in vitro*.—E. M. Hume.

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ERSHOFF, B. H. and GREENBERG, S. M. **Effects of a transient vitamin A deficiency on survival following X-irradiation.** *Exp. Med. Surg.*, 1953, **11**, 46-48. [Emory W. Thurston Labs., Los Angeles.]

Young rats reared to have low reserves of vitamin A were maintained from weaning on a vitamin-A-free diet. Half of them received 50 U.S.P.U. vitamin A 6 times weekly from weaning but half of them did not receive the supplement until 3 weeks after weaning. After 14 weeks the groups were outwardly indistinguishable, and 16 from each group received a single exposure to X-rays of 750 r. In the ensuing 50 days almost all the rats in both groups died, but the survival time of those that had suffered depletion was 12.7 ± 1.7 days, and of those that had not 26.2 ± 3.0 .—E. M. Hume.

331

CERECEDO, L. R., PRICE, H. P. and LOMBARDO, M. E. **Nucleic acid changes in rats receiving butter yellow, and the effects of vitamin A deficiency on these changes.** *Exp. Med. Surg.*, 1953, **11**, 31-45. [Dept. Biochem., Fordham Univ., New York.]

332

CHANDA, R., CLAPHAM, H. M. and OWEN, E. C. **The effect of carotene deprivation on the composition of the blood of the cow.** *J. Physiol.*, 1953, **121**, 42P. [Hannah Dairy Res. Inst., Kirkhill, Ayr.]

333

GANGULY, J., MEHL, J. W. and DEUEL, H. J. (Jr.) **Studies on carotenoid metabolism. 12. The effect of dietary carotenoids on the carotenoid distribution in the tissues of chickens. 13. The carotenoid composition of the blood, liver and ovaries of the rat, ewe, cow and frog.** *J. Nutrition*, 1953, **50**, 59-72; 73-83. [Dept. Biochem., Univ. S. California, Los Angeles.]

12. The blood plasma of laying hens, reared on a general farm diet, contained, per 100 ml., 162 μ g. lutein but only 4.2 μ g. β -carotene. Considerable amounts of lutein and only small quantities

of β -carotene were found also in the ovaries and body fat of the hens and in the yolks of their eggs. Day-old chicks fed on a diet deficient in carotenoids yielded hens whose tissues were devoid of carotenoids. Chickens devoid of carotenoids when given 7 mg. cryptoxanthin every 3 days contained 213 μ g. cryptoxanthin per 100 ml. plasma and 5.4 μ g. per g. liver. Carotenoid-free hens when given 7 mg. zeaxanthin every 3 days had 526 μ g. zeaxanthin per 100 ml. blood plasma, 3.4 μ g. per g. liver and 68.6 μ g. per g. ovary. When α - or β -carotene was given only traces were found in the blood, and small quantities only in the liver, ovaries and egg yolks. When 24 mg. lycopene were given in 12 days the values for it were 7.2 μ g. per 100 ml. plasma, 1.4 μ g. per g. liver and 1.2 μ g. per g. ovary. When doses ranging from 2 to 6 mg. of α - or β -carotenes or zeaxanthin in colloidal solution were injected intravenously no carotenoid was found in the blood 24 hr. later but amounts ranging from 3.9 to 10.4 μ g. per g. were present in the liver. It is suggested that carotenoids may be present in blood combined with a specific constituent.

13. When 0.63 μ g. β -carotene had been given daily to rats for 3 days and they were killed on the fifth day, the blood contained no carotene but an average of 2.1 μ g. per g. was present in the liver. Ewes on a diet low in carotene and carotenoids contained in the liver 0.5 μ g. carotene and 0.4 μ g. xanthophylls per g. tissue. No carotenoids were found in the blood or ovaries. Cows fed on a diet high in carotene but low in carotenoids had average values for carotene of 435 μ g. per 100 ml. plasma, 20.6 μ g. per g. liver and 112.8 μ g. per g. ovary; the corresponding figures for xanthophylls were 16.9, 1.2 and 3.1. In male and female frogs the average carotene values for the liver were 14.7 and 8.5 μ g. per g., respectively; the corresponding values for xanthophylls were 7.7 and 3.7. The ovaries contained per g. 3.9 μ g. carotene and 10.5 μ g. xanthophylls but no carotenoids were detected in the blood. The authors suggest that differences between species in the absorption and deposition of carotenoids may be related to the presence or absence of appropriate protein receptors in the tissues and blood of the respective animals.

I. M. Sharman.

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SAPUNOV, V. A. **Dinamika karotinoidov v krovi loshadei. [The dynamics of carotenoids in the blood of horses.]** *Konevodstvo*, 1953, No. 4, 24-27.

The level of carotene and total carotenoids in the blood of horses during winter stall feeding depended on the carotenoid content of the feed. In spring towards the end of stall feeding it fell with the decreasing amounts in the feed. Hard

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work led to a low level of carotene in the blood. When large amounts of carotene were given, as in large feeds of carrots, large amounts were excreted in the faeces. The blood carotene value was higher in horses given a regular and abundant supply of carotene than in horses given carotene in large doses irregularly. On intravenous injection of carotene the level of blood carotene decreased or remained constant. When small amounts of carotene were given intravenously the level in the blood increased for a short time.—W. Hughes.

335

BAKER, F. H., MACVICAR, R., POPE, L. S. and WHITEHAIR, C. K. **Placental and mammary transfer of vitamin A and carotene by beef cows.** *Proc. Soc. Exp. Biol. Med.*, 1953, **83**, 571-574. [Dept. Animal Husb., Oklahoma Agric. and Mech. Coll., Stillwater.]

Hereford cows in the second or third month of pregnancy and given a ration low in carotene were divided into 4 groups, one given no supplement and 3 given supplements of 60 μ g. carotene per lb. bodyweight during lactation or during gestation or during both. The average vitamin A content of the liver in μ g. per g. dry matter of the 4 groups 6 months before parturition was 68.9, 70.6, 122.6 and 92.2, respectively; at parturition the average values were 5.7, 9.4, 20.6 and 14.3, and 3 months after parturition 1.7, 18.9, 7.4 and 23.4. The values for the livers of the calves of the respective groups at parturition was 4.2, 3.4, 2.6 and 3.0, and 3 months after parturition 1.9, 14.2, 5.1 and 22.3. The plasma vitamin A value in μ g. per 100 ml. fell from about 23 at 6 months before parturition to about 8 at 3 months before parturition for the first two groups, and rose at parturition to 11.3 and 15.1, respectively. The values for the plasma in the groups treated during gestation and during gestation and lactation fell from about 22 at 6 months before parturition to 10.1 and 14.2 at 3 months before parturition, and rose to 16.3 for both groups at parturition. During lactation the plasma values remained fairly constant. Plasma carotene levels, in μ g. per 100 ml., were 40.3, 45.8, 46.6 and 35.2 at 6 months before parturition, 11.6, 12.9, 31.1 and 25.8 at 3 months before parturition, 11.8, 10.3, 23.4 and 24.5 at parturition, 8.8, 52.6, 15.7 and 87.8 at 2 weeks after parturition, and 12.0, 43.0, 13.0 and 46.7 at 12 weeks after parturition. The vitamin A content of the colostrum declined rapidly and that of the milk remained almost constant during lactation.—R. J. Ward.

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KENDALL, K. A. and HARSHBARGER, K. E. **Plasma carotene and vitamin A levels of dairy cows before and after parturition.** *J. Dairy Sci.*, 1953, **36**, 583. *Proc.* [Univ. Illinois, Urbana.]

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NARAYANAN, K. M., ANANTAKRISHNAN, C. P. and SEN, K. C. **Studies on vitamin A in milk. 6. The influence of continued intake of shark liver oil on the vitamin A content of milk and butterfat.** *Indian J. Dairy Sci.*, 1953, **6**, 67-74. [Indian Dairy Res. Inst., Bangalore.]

The milk yield, percentage fat and vitamin A potency of the milk remained unaltered when cows on a diet of high carotene content were given supplements of shark liver oil. On a diet of medium carotene content the shark liver supplement, equivalent to 100,000 I.U. vitamin A, caused a temporary increase in the vitamin A potency of the milk fat to 30 I.U. per g. from about 24. In a dry fodder period a supplement of 200,000 I.U. vitamin A in shark liver oil increased the vitamin A potency to 50 from about 24 I.U. per g. fat of milk from cows, and to 32 from 18 I.U. per g. fat of milk from buffaloes.

R. J. Ward.

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BHATIA, I. S. **Vitamin A content of cow's butterfat.** *Bull. Central Food Technol. Res. Inst., Mysore*, 1953, **2**, 178-179. [Div. Quality Control, Central Food Technol. Res. Inst., Mysore.]

Vitamin A was estimated spectrographically in the butterfat of milk from 10 Desi cows. It varied from 17.5 to 61.0 I.U. per g. butterfat and tended to decrease as lactation progressed.—P. C. Jowsey.

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BARABANSHCHIKOV, N. and FROLOVA, N. **Soderzhanie vitamina A v moloche koby.** [The vitamin A content of mare's milk.] *Konevodstvo*, 1953, No. 4, 43-45. [Zootekh. Inst. Konevodstva, Moscow.]

Estimation of vitamin A in mare's milk gave the following results in mg. per 100 ml.: April 1, 0; April 30, 0; May 30, 0.0832; June 30, 0.0786; July 30, 0.0640; August 30, 0.0650; September 30, 0.0510; October 30, 0.0320; November 30, 0.0125. The results show that mare's milk contained more vitamin A (0.0684 against 0.0351) than cow's milk when the animals were on pasture, but during stall feeding the cow's milk contained 0.0113 and mare's milk none. The vitamin A content of mare's milk obviously depends on the availability of the vitamin in the diet; it is therefore essential to ensure a sufficiency in the diet so that there will be some in the milk during stall feeding.—W. Hughes.

340

COX, D. H., COULTER, S. T. and LUNDBERG, W. O. **The stability of added vitamin A in fluid and dry milks.** *J. Dairy Sci.*, 1953, **36**, 572-573. *Proc.* [Univ. Minnesota, St. Paul.]

341

FAN, W. H. and HOU, H. C. Carotene contents of certain Nanking vegetables and fruits. *Chinese Med. J.*, 1953, **71**, 127-134.

Carotene was estimated in representative samples of the edible portion of 58 vegetables and fruits bought in the Nanking market. The material was ground with 50 per cent. KOH and extracted with ethanol; light petroleum was added and water. The light petroleum layer was removed, and the remainder was exhaustively extracted with light petroleum. The whole light petroleum extract was repeatedly extracted with 90 per cent. ethanol to remove xanthophylls. After further purification carotene was estimated in the light petroleum extract against a standardised solution of potassium dichromate. The results with the Chinese, English and Latin names of the plants are tabulated. The possible loss at the different stages of the method was tested by the recovery of added carotene, which amounted to from 82 to 100 per cent.—E. M. Hume.

342

CLARKE, M. F. A study of the carotene and crude protein content of orchardgrass (*Dactylis glomerata* L.) 2. Heritable variation. *Canad. J. Agric. Sci.*, 1953, **33**, 246-253. [Dept. Agronom., Pennsylvania State Coll.]

Open-pollinated clones and fifth generation inbreds (I_5) from a group of orchard grass plants were studied for heritable variation in the content of carotene and crude protein. All plants were given an initial clip to bring them into standard condition and were sampled when at the vegetative stage or when 6 in. high.

In two series which are described, with clones low and high in both carotene and protein, there was no significant difference between the mean values for the hybrid plants with I_5 clones, but with open-pollinated clones the hybrids showed a highly significant difference for both carotene and protein.—V. H. Booth.

See also Absts. 223, 226, 227, 230, 258, 352.

VITAMIN D

343

HÖVELS, O. Die chemische Bestimmung des D-Vitamins in der UV-bestrahlten Milch. [Chemical estimation of vitamin D in milk irradiated with ultraviolet light.] *Monatsschr. Kinderheilk.*, 1953, **101**, 176-177. *Proc.*

See Abst. 4158, Vol. 23.

344

SHAW, W. H. C. and JEFFERIES, J. P. The determination of ergosterol in yeast. 1. The ultraviolet absorption of purified ergosterol. 2. Determination by saponification and ultraviolet absorption spectroscopy. 3. Corrections for irrelevant absorption in solutions of ergosterol. 4. A short method based on ultraviolet absorption. *Analyst*, 1953, **78**, 509-514; 514-519; 519-523; 524-528. [Glaxo Labs., Ltd., Greenford, Middlesex.]

1. Ergosterol was converted into its benzoate, which after recrystallisation five times was hydrolysed. The resulting ergosterol, after recrystallisation, was used for the construction of ultraviolet absorption curves for use in the estimation of ergosterol in yeast.

2. Yeast was treated by boiling under reflux with 40 per cent. KOH; the extract after purification was treated with digitonin. The precipitate obtained was dissolved in alcohol and the solution was used for spectroscopic estimation of ergosterol. There was no difference in absorption due to digitonin.

3. The digitonin precipitation could be avoided by applying a four-point geometrical correction

procedure to allow for irrelevant absorption. If the amount of ergosterol present was small the correction gave only an approximate value, and accurate results were obtained only by the digitonin procedure.

4. In the final semimicro-method, saponification of a sample of yeast was followed by extraction of the unsaponifiable matter with cyclohexane. The extract was used for spectroscopic estimation at an absorption maximum of 282 $m\mu$. The digitonin precipitation was not employed, but the geometrical correction procedure for irrelevant absorption was used. The method was rapid, but a somewhat greater standard deviation and lower results were obtained than by the full digitonin method.

R. Marshall.

345

GRAB, W. Pharmakologie des Vitamin D. [Pharmacology of vitamin D.] *Monatsschr. Kinderheilk.*, 1953, **101**, 163-175. *Proc.* [Wuppertal-Elberfeld.]

346

RAOUL, Y., LE BOULCH, N., CHOPIN, J., MEUNIER, P. and GUERILLOT-VINET, A. Données nouvelles sur les substances antirachitiques naturelles; leur présence dans les végétaux. [New data on natural antirachitic substances; their presence in plants.] *C.R. Acad. Sci.*, 1953, **237**, 439-440.

The new antirachitic substance previously obtained from fish liver oils (Abst. 2853, Vol. 23) was further investigated and compared with the

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substance prepared from 2:4:2':4'-dicholestadiene with which it was first thought to be identical. The spectral absorption of both substances was in the ultraviolet between 250 and 265 $m\mu$. but the m.p. of the synthetic substance was 244° C. and of the natural one 136° C.; the molecular weights were 800 and 400. The two substances were thus steroids belonging to a double and a single series. Synthesis of both compounds was achieved. The active single substance and an inactive precursor were prepared from an ethanol extract of grass. Both the single and the double substance were regarded as carriers of Ca because of their selective capacity for fixing Ca reversibly *in vitro*.

E. M. Hume.

347

WARD, R. J. and MOORE, T. **7-Dehydrosterol in the sexual organs of the rat.** *Biochem. J.*, 1953, **55**, 295-298. [Dunn Nutrit. Lab., Univ. Cambridge.]

In the course of a spectrophotometric study of the distribution of vitamin A in the male reproductive system of the rat, well-defined absorption bands at 293, 282, 272 and 262 $m\mu$. were detected. The bands were characteristic of 7-dehydrocholesterol or ergosterol, but the substance was not isolated in pure form so is referred to as 7-dehydrosterol. It was present in high concentration in the caput epididymis, corpus epididymis and preputial glands of adult male rats and in the bulbi vestibuli of female rats. Alterations in the diet of adult rats and deprivation of vitamin A had no effect on the presence of 7-dehydrosterol in these organs. It was found also in wild brown rats but not in immature rats or in the guineapig, rabbit or ram. An irradiated extract of rat preputial glands had antirachitic activity.

A. M. Copping.

348

HANAHAN, D. J. and WAKIL, S. J. **Studies on absorption and metabolism of ergosterol- C^{14} .** *Arch. Biochem. Biophys.*, 1953, **44**, 150-158. [Dept. Biochem., Univ. Washington, Seattle 5.]

Ergosterol- ^{14}C was prepared from yeast incubated with acetic acid- ^{14}C . Adult rats were prepared with a lymph fistula or a bile fistula. Ergosterol- ^{14}C was administered orally or into the femoral vein. The radio-activity of certain tissues was estimated. Ergosterol was isolated from some of the material and estimated on the basis of its absorption at 282 $m\mu$.; the extent of its radio-activity was measured.

In 4 normal, adult rats given radio-active ergosterol orally, most of it was in the gut contents but small amounts were found in the liver, lungs, adrenal glands, spleen and urine. In rats with a thoracic duct fistula, treated in the same way, from 2.2 to 4.8 per cent. of the administered radio-

activity was found in the lymph; there was none in the liver. When radio-active ergosterol was given intravenously to normal rats, most of the radio-activity was in the liver with some in the lungs, spleen and intestinal contents, and a very small amount in the adrenal glands and urine. When radio-active ergosterol was given intravenously to rats with a bile fistula, 34 per cent. of the radio-activity passed into the bile within 72 hr.; a considerable amount of the remainder was in the liver with some in the lungs and spleen, and a little in the adrenal glands. None of the radio-activity of the bile could be identified as ergosterol. Evidence was obtained that none of the radio-active ergosterol was converted into cholesterol, but the exact chemical nature of the absorbed compound was not determined.—E. M. Hume.

349

CAUSERET, J. La vitamine D, facteur de régulation du pouvoir physiologique de fixation du calcium. [Vitamin D, the factor regulating the physiological capacity for calcium fixation.] *C.R. Acad. Sci.*, 1953, **237**, 104-106.

Male rats, aged from 40 to 50 days and weighing from 60 to 80 g., were fed on a diet of casein 18, arachis oil 9, starch 45, saccharose 24, salt mixture of Hubbel without $CaCO_3$ 2, and agar 2 per cent., with fat-soluble and water-soluble vitamins. Nine groups of 8 rats received additions of Ca ranging from 0.037 to 2.066 per cent., with Ca:P ratios ranging from 0.15 to 8.27. Each dietary group was divided into 2 so that 4 rats received 300 I.U. vitamin D per 100 g. ration and 4 received none. Ca was estimated in the food, urine and faeces and Ca retention was calculated. Without vitamin D, the graph relating Ca retention to intake was almost linear, retention increasing progressively with increasing intake. With vitamin D, retention was greater than without it for the smaller intakes, but for the 3 intakes greater than 0.466 per cent. there was no further increase in retention, which then became less than without vitamin D.

It is concluded that it is incorrect to call vitamin D a factor for the fixation of Ca; it is rather a factor which regulates the fixation.—E. M. Hume.

350

THEOPOLD. Leberfunktion und D-Vitaminwirkung. [Liver function and action of vitamin D.] *Monatsschr. Kinderheilk.*, 1953, **101**, 178. *Proc.* [Marburg.]

351

BURMEISTER, W. Über den Citronensäure-Gehalt im Knochen bei Rachitisheilung. (Tierexperimentelle Untersuchungen.) [Citric acid content of bone during the healing of rickets.]

Animal experiments.] *Ztschr. Kinderheilk.*, 1953, **73**, 312-318. [Kinderklin., Univ. Kiel.]

In rachitic rats the citric acid and ash content of the bone was about half the normal. Administration of Vigantol gave more complete restoration to normal than administration of citric acid, but the difference was not very great.—R. Marshall.

352

DE BASTIANI, G. and ZATTI, P. *Sindrome generale di adattamento da iperdosaggio della vitamina A o della vitamina D₂ nel ratto albino. [General syndrome of response to excess of vitamin A or vitamin D in the albino rat.] Boll. Soc. ital. Biol. sper.*, 1953, **29**, 231-233. [Ist Fisiol., Univ. Padua.]

Young rats of about 80 g. weight in 11 groups of 14 were given 0.5, 1, 2, 4 or 6 thousand I.U. vitamin A, or 0.25, 0.5, 1, 2 or 4 thousand I.U. vitamin D, by intramuscular injection daily for up to 40 days. One group received no treatment. Two rats in each group were killed every 5 or 6 days. The changes which took place in the thymus and adrenal glands and in the leucocyte count are described. They were considered to show no evidence of any toxic effect but, with the increasing doses of both vitamins, they showed the changes which are considered characteristic of response to stress.—E. M. Hume.

353

FROELICH, A. *Hautveränderungen und Krampfverhütung unter D₂-Hypervitaminose bei jungen Albinoratten. [Skin changes and prevention of cramp during administration of excess vitamin D₂ to young Albino rats.] Arch. exp. Pathol. Pharmacol.*, 1953, **219**, 512-517. [May Inst. Med. Res., Jewish Hosp., Cincinnati, Ohio.]

It had been found that acid fuchsin no. 72, injected into rats between 7 and 18 days old, induced cramps, often fatal. In older rats it did not do so unless injected into the brain, and it was concluded that the so-called *Blut-Gehirn-Schranke*, protecting the brain, became established only about the 21st day of life. Large doses of vitamin D, 1000 I.U. or more given daily for several days, prevented the occurrence of cramps, but theophyllin counteracted the protective action of vitamin D, a finding which is attributed to reduction of permeability.

Changes are described in the skin of rats given large doses of vitamin D before the 15th day of life. The skin became scaly and hairless, particularly on the top of the head, and there were deposits of Ca in it.

[The author of these experiments is dead. They were carried out in 1942-43, and specimen experiments are now published in celebration of the 80th birthday of Professor Otto Loewi.]—E. M. Hume.

354

SCHLUMBERGER, H. G. and BURK, D. H. *Comparative study of the reaction to injury. 2. Hypervitaminosis D in the frog with special reference to the lime sacs. Arch. Pathol.*, 1953, **56**, 103-124. [Dept. Pathol., Coll. Med., Ohio State Univ., Columbus.]

The paravertebral lime sacs of the frog are multilocular gland-like structures lined with cuboidal epithelium which probably secretes Ca into the sac. About 93 per cent. of the Ca in the sacs is CaCO₃ as the mineral aragonite.

The animals used were the leopard frog, *Rana pipiens*, and the African clawed toad, *Xenopus laevis*. They were received in good condition and not subsequently fed. Vitamin D₂ or D₃ was injected into the thigh muscles or coelomic cavity. Blood was taken from the heart under anaesthesia.

When the frogs were placed in a 0.8 per cent. solution of CaCl₂, X-ray photographs showed slow increase of Ca in the lime sacs, and appearance of some masses of Ca, found to be phosphate or carbonate, in the gut. It was concluded that Ca entered the body as swallowed water and not through the skin. With intramuscular injection of 30,000 U.S.P.U. or more of vitamin D₂ without added CaCl₂, Ca accumulated in the sacs within 2 or 3 weeks; in frogs kept in tap water it came from the bones. When vitamin D₂ was given after a sojourn in 0.8 per cent. CaCl₂ solution, accumulation of Ca in the sacs was rapid and prolonged. When vitamin D₂ in such large doses was given with or without added Ca in the water, osteoporosis occurred. Bone fractures in frogs heal with a large cartilaginous callus: vitamin D₂ did not accelerate its calcification. With large doses of vitamin D₂, 100,000 U.S.P.U. or more, with or without added Ca, metastatic calcification took place in the lumen of the renal tubules; the salt deposited was Ca phosphate. No definite changes could be detected in the parathyroid glands from giving vitamin D₂. No change in the serum Ca or P was detected on giving CaCl₂ or vitamin D₂ or D₃, but with both vitamin D₂ and CaCl₂, the level was significantly raised. The lime sacs are thought to play a part in stabilising the level of Ca in the serum. Vitamin D₂ was more active than vitamin D₃ in promoting filling of the lime sacs.

The African clawed toads are more primitive than the leopard frogs and appeared to have no lime sacs, although it was possible to raise the serum Ca value very materially. Osteoporosis and metastatic calcification were the same as in the frogs.

It is thought probable that the lime sacs act as a store for Ca in the absence of trabecular bone which has that function in higher vertebrates.

E. M. Hume.

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VITAMIN E

355

THOMPSON, J. J. and SMITH, N. C. **Exudative diathesis in chicks in New Zealand.** *Austral. Vet. J.*, 1953, **29**, 89-97. [Animal Indust. Div., Dept. Agric., New Zealand.]

During 1950 and 1951 outbreaks of an unidentified disease among chicks were reported from the Dunedin, Invercargill and Canterbury areas of South Island. Some of the outbreaks were severe with high mortality. Subsequent investigation appears to have established that the condition was a severe form of exudative diathesis like that recorded by Dam and Glavind in 1949 (Abst. 4131, Vol. 9). It could be prevented by the addition of *dl*- α -tocopherol to the ration. The amount of fish liver oil in the diet of the affected chicks varied from 1 to 3 per cent., and it is suggested that an additional precipitating factor may have been the presence of "heated" or mouldy wheat.

A. N. Worden.

356

MCDONOUGH, L. T. **Vitamin E deficiency among dairy calves fed on coconut meal.** *Vet. Rec.*, 1953, **65**, 425-426. [Dept. Agric., Jamaica, B.W.I.]

Calves, which had been fed on a balanced diet, were grazed on irrigated guinea grass and given coconut meal as part of a supplement of concentrates. Two calves died, and post-mortem examination revealed white muscle disease. No further case occurred when the coconut meal, which may have been rancid, was withdrawn from the ration.

R. J. Ward.

357

RUCCIA, D. **Accrescimento corporeo di ratti a dieta priva di vitamina E, integrata con olio di oliva.** [Growth of rats on diet devoid of vitamin E, supplemented with olive oil.] *Boll. Soc. ital. Biol. sper.*, 1953, **29**, 144-146. [Ist. Fisiol., Univ. Bari.]

Small numbers of young male and female rats of from 35 to 40 g. weight, given for 84 days a diet deficient in vitamin E or the same with 20 per cent. of different types of olive oil, showed no consistent difference in weight increase.

E. M. Hume.

358

MOORE, T., SHARMAN, I. M. and WARD, R. J. **The partial vitamin E activity of malachite green.** *Proc. Nutrit. Soc.*, 1953, **12**, v. [Dunn Nutrit. Lab., Univ. Cambridge.]

359

MILMAN, A. E., SILIDES, D. N. and MILHORAT, A. T. **Nitrogen metabolism of isolated muscle**

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of normal and vitamin E-deficient hamsters. *Proc. Soc. Exp. Biol. Med.*, 1953, **83**, 637-638. [Dept. Psychiat., Cornell Univ. Med. Coll., New York.]

Young hamsters were kept for from 4 to 5 weeks on a diet deficient in vitamin E. Histological studies showed that the muscles had become dystrophic. Slices of the gastrocnemius muscle and of the diaphragm from these animals and from others which had been given vitamin E throughout were incubated in a Krebs Ringer bicarbonate buffer solution, and the breakdown of protein was measured by the increase of amino-N in the fluid. For the gastrocnemius muscle of the deficient and normal hamsters, respectively, the difference between the readings after 15 and 60 min. was 27.9 and 33 μ g. N per 100 g. wet tissue. For the diaphragm the corresponding values were 25.8 and 32.0. Similar results were obtained with rabbits. The loss of muscle protein in vitamin E deficiency cannot therefore be explained by an increase in the rate of breakdown. A low rate of protein synthesis in the deficient animals seemed probable.

T. Moore.

360

FERDMAN, D. L. and GRIGOR'EVA, V. A. **Intensivnost' obmena fosfornykh soednienii v mysh-tsakh krolikov pri eksperimental'noi myshechnoi distrofii (avitaminoze E.).** [Rate of exchange of phosphorus compounds in the muscles of rabbits during experimental muscular dystrophy (vitamin E deficiency).] *Dokl. Akad. Nauk. S.S.S.R.*, 1952, **85**, 863-866. [Inst. Biokhim., Akad. Nauk SSSR.]

Normal rabbits and rabbits deprived of vitamin E were given Na_2HPO_4 containing radio-active P. Two hr. later they were killed; the muscles were removed and the rate of uptake of P was estimated by measuring radio-activity, total P, water-soluble P, adenosinetriphosphate, inorganic phosphate and creatine phosphate. The rate of exchange of the several P compounds was considerably higher in the muscles of the dystrophic rabbits than in those of the normal animals. Additional experiments showed that the amount of radio-active P in the blood plasma of the two groups was similar and that the rate of uptake of radio-active P in the several P fractions from muscles of starved rabbits was somewhat lower than in those of normal animals.—W. Hughes.

361

ROSENKRANTZ, H. and MILHORAT, A. T. **Arginase activity in vitamin E-deficient rats.** *Proc. Soc. Exp. Biol. Med.*, 1953, **83**, 57-59. [Dept. Med., Cornell Univ. Med. Coll., New York.]

Male rats in 3 groups of 30 animals each were given a diet deficient in vitamin E. One group was given a daily supplement of α -tocopherol and another was given L(+)-arginine monochloride, starting with a dose of 100 mg. daily and rising in 6 weeks to a maximum of 600 mg. Testicular changes were recorded from periodic biopsies. The arginase content of the liver and kidneys was estimated by the method of Kochakian (*J. Biol. Chem.*, 1945, **161**, 115). In about 70 per cent. of the deficient animals testicular degeneration was severe and was not prevented by the arginine supplement. The arginase content of the kidneys and livers in all the groups was the same.

R. J. Ward.

362

TENTORI, L., TOSCHI, G. and VIVALDI, G. L'effetto dell'ipertiroidismo sperimentale sulla comparsa di lesioni muscolari nel ratto mantenuto ad una dieta carente di vitamina E. [Effect of experimental hyperthyroidism on the appearance of muscular lesions in rats maintained on a diet without vitamin E.] *Boll. Soc. ital. Biol. sper.*, 1953, **29**, 90-91. [Ist. Superiore Sanità, Rome.]

Of 16 rats given a diet deficient in vitamin E, 8 received in addition 0.5 per cent. dried thyroid powder. Some were killed after 2 and some after 3 months. In another experiment more vitamin A was given, the thyroid extract was given separately and a group was included receiving vitamin E. Histological examination of the muscles showed that the lesions typical of vitamin E deficiency appeared more quickly when thyroid extract was given.—E. M. Hume.

363

PIANA, G. Azione masteoplastica della vitamina E. [Effect of vitamin E on the growth of the mammary gland.] *Boll. Soc. ital. Biol. sper.*, 1953, **29**, 18-19. [Ist. Zootec., Univ. Milan.]

Fifteen young virgin guineapigs in 3 groups were given for 90 days a normal diet alone or with 10 or 20 mg. vitamin E given orally. Histological examination of the mammary tissues showed the development of alveoli in the parenchyma of the treated animals and the beginning of secretory activity.—E. M. Hume.

364

CASSELMAN, W. G. B. Factors influencing the formation of ceroid in the livers of choline-deficient rats. 1. Dietary fats. 2. Dietary antioxidants. *Biochim. biophys. Acta*, 1953, **11**, 445-446; 446-447. [Banting and Best Dept. Med. Res., Univ. Toronto, Ont.]

1. Young rats were given diets lacking choline and containing 0.01 per cent. of added tocopherol.

One group received the diet without fat except for a supplement of methyl linoleate. The diets of the 6 other groups contained 10 per cent. of hydrogenated cottonseed oil of iodine value (i.v.) 12 or 36, or of cocoa butter i.v. 36, or of beef tallow i.v. 40, or of cottonseed oil i.v. 111, or of a mixture of 4 parts of cod liver oil with 6 parts of maize oil i. v. 125. Supplements of choline were given during the early stages of the experiment to prevent renal lesions. The rats were killed after receiving the diets for from 55 to 126 days, and the concentration of ceroid pigment in the liver was assessed by staining paraffin sections with Oil Red O. No difference was found in the degree of fatty infiltration between the several groups. After from 55 to 75 days the amount of ceroid in the livers of rats which had received no fat was graded as a trace, but after from 105 to 126 days the grading had risen to 2. In the groups given beef tallow or either of the hydrogenated cottonseed oils the grading was a trace at both times, and in those given cocoa butter 1. In the groups given the more highly unsaturated mixture of cod liver oil and maize oil, the livers contained much more ceroid, with a grading of 2 after from 55 to 75 days and 3 after from 105 to 126 days.

2. Three groups of male rats, of bodyweight from 180 to 200 g., were given a diet deficient in both choline and vitamin E. One group was fed to appetite without supplement; the other groups were limited to the amount of food eaten by the rats in the first group, but received a supplement of 0.05 per cent. α -tocopheryl acetate or of 0.1 per cent. methylene blue. A supplement of choline was given during the first 18 days to prevent renal lesions, and the rats were killed after from 52 to 62 days. In all 3 groups the rats failed to grow normally, and the degree of fatty infiltration of the liver was the same. The grading for ceroid was 3 in the group with no supplement, 2 in that given tocopherol and 1 in that given methylene blue. The findings support the view that ceroid is formed from tissue lipids which have accumulated in abnormal amount in conditions favouring auto-oxidation.—T. Moore.

365

TAYLOR, D. W. Effects of vitamin E deficiency on oxygen toxicity in the rat. *J. Physiol.*, 1953, **121**, 47P-48P. [Dept. Physiol., Univ. Aberdeen.]

366

HOVE, E. L. The relation of pyridine toxicity in rats to dietary vitamin E. *J. Nutrition*, 1953, **50**, 361-371. [Dept. Animal Husb., Alabama Polytech. Inst., Auburn.]

Young rats were given a diet which contained 10 per cent. casein, and supplemented by individual

vitamins. For some of the animals the supplements included *dl*- α -tocopheryl acetate, but others received no vitamin E. Pyridine was given to some as 1 per cent. of the diet, or in single injections of 0.5 or 1 ml. per kg. bodyweight. In the rats not given vitamin E, pyridine caused the death of 64 per cent. and produced liver lesions in 74 per cent., compared with only 16 and 20 per cent. of the rats given vitamin E. In additional groups of rats methylene blue gave considerable, and yeast nucleic acid slight, protection against pyridine. In measurements with Warburg's respirometer, pyridine accelerated the O_2 uptake of lard, olive oil, maize oil and cod liver oil. With lard $\alpha\alpha'$ -dipyridine also increased the O_2 uptake, but piperidine and nicotinate had no effect. Methylene blue reduced the increased rate of O_2 uptake caused in cod liver oil by pyridine. It is suggested that the toxicity of pyridine was due to its pro-oxidant activity, which caused the formation of small amounts of fatty acid peroxides in the body.

T. Moore.

367

TEDESCHI, G. G. and DE CICCO, A. Azione anti-vitaminica E degli esteri succinico e acetico dell'*o*-cresolo. [Antagonistic action of succinic and acetic esters of *o*-cresol to vitamin E.] Azione del succinato di *o*-cresolo sulla ghiandola mammaria. [Action of the succinate of *o*-cresol on the mammary gland.] *Quad. Nutrizione*, 1952, **12**, 414-421; 422-428. [Ist. Fisiol. Gen., Univ. Rome.]

The succinate and acetate of tri-*o*-cresol were prepared. After preliminary experiments with rats and 2 rabbits, 10 pregnant rats were given a single oral dose of 25 mg. succinate or acetate; 7 gave birth to normal litters, 2 suffered resorption

and 1 gave premature birth to a dead litter. Eight female rats were injected with 25 mg. acetate or succinate and were then mated. When 2 were killed after 13 days they contained dead fetuses with abnormal placentas. The rest were killed 25 days after the first mating, when all contained litters in process of resorption. Six male rats were given 25 mg. succinate orally and 3 were given further doses 12 and 24 days later. They were killed at intervals up to 55 days, and the germinal epithelium showed signs of degeneration of typical vitamin E deficiency. Female rats given just before mating 24 mg. succinate and at the same time 5, 10 or 25 mg. α -tocopherol produced normal litters. In male rats given the same doses, the germinal epithelium was normal.

The methyl ether of *o*-cresol had no anti-vitamin-E activity.

Of 9 sexually immature female rats weighing about 70 g. and maintained on a normal diet, 3 received daily for 10 days a subcutaneous injection of 1 mg. α -tocopherol, 3 received the same with 20 mg. *o*-cresol succinate, and 3 received no treatment. They were then killed and the mammary tissue was investigated. The *o*-cresol succinate counteracted the effect of tocopherol in stimulating the development of the gland. In a similar experiment with sexually mature rats, *o*-cresol succinate caused hyperplasia of the connective tissue of the mammary gland and disturbances of the epithelium in the secretory region, which were counteracted with α -tocopherol. In pregnant rats treated in the same way the activity of the mammary gland in lactation was checked by *o*-cresol succinate and the effect was counteracted by α -tocopherol.

E. M. Hume.

See also Absts. 291, 317, 329.

VITAMIN K

368

MORAUX, J., MEUNIER, P. and MENTZER, C. Sur une nouvelle antivitamin K dissymétrique, l' α -naphthyl-3 hydroxy-4 coumarine. [A new

asymmetrical anti-vitamin-K, α -naphthyl-3-hydroxy-4-coumarin.] *Arch. internat. Pharmacodyn.*, 1953, **94**, 47-64. [Lab. Chim. Biol., Fac. Sci., Univ. Lyons.]

VITAMIN B COMPLEX: GENERAL

369

PRITCHARD, H. The selection of methods for routine assays for members of the vitamin-B complex. *Analyst*, 1953, **78**, 460-465 (with discussion 465-466). [13 Hamilton Sq., Birkenhead, Cheshire.]

Methods are discussed for the microbiological estimation of vitamin B₁, riboflavin, nicotinic acid, pantothenic acid, pyridoxine, cobalamin, inositol and choline. The test organism, type of

test, end-point and range of test are given. Difficulties are discussed concerning the method of preparation of the sample, the purity of the chemicals used to prepare the media, and the presence of antibiotics in the materials being tested.—R. Marshall.

370

ROMBOUTS, J. E. The destruction of B vitamins by certain salt mixtures in purified rations.

J. Nutrition, 1953, **50**, 255-266. [Biol. Lab., Royal Netherlands Yeast and Spirit Factory, Delft, Holland.]

Purified diet, 6 kg., was prepared according to the formula of Rombouts and Querido (Abst. 4248, Vol. 16), 40 g. salt mixture being supplied as the U.S.P. formula (1936, U.S.P. XI, p. 479), or as that of Phillips and Hart (Abst. 1842, Vol. 5), or as 20 g. of each. Fresh batches of diet were required for the 3 groups of weanling rats receiving the diets after 16, 20 and 22 days, respectively.

Growth of rats in the first group was continuous and good; in the third, it had stopped after 20 days but was restored to normal when fresh food was given. In the second group, the rats lost weight after 18 days, and grew at a suboptimum rate when fresh food was given but died after about 5 weeks. Optimum growth could be obtained with the Phillips and Hart mixture when cod liver oil was mixed into the diet and 6 B vitamins were given orally twice a week. When the B vitamins were incorporated in the diet, most of the animals died in 5 weeks whether cod liver oil was given separately or in the diet. The pH value of the U.S.P. salt mixture, 5.4 in 2 per cent. suspension, was adjusted to 6.5 and that of the Phillips and Hart mixture, usually 6.3, to 5.4. Growth was still excellent with the U.S.P. mixture and much improved with the other. Omission of Zn and Cu from the mixture did not improve growth, and addition of these to the U.S.P. mixture had no harmful effect.

In further tests diet was prepared in advance so that the minerals of the Phillips and Hart mixture could react with the vitamins; rats then received the diet with a supplement of one of the 6 B vitamins employed. Growth was significantly greater in the group given vitamin B₁. When the diet was prepared with inclusion of only one of the B vitamins, the other 5 being given orally, growth was least when vitamin B₁ was the one mixed into the diet. It was apparent that vitamin B₁ was the most affected by the salt mixture of Phillips and Hart, and riboflavin the least. The effect may have been caused partly by the higher pH value in watery suspension.—V. R. Jackson.

371

SHIVE, W. **B-Vitamins involved in single carbon unit metabolism.** *Federation Proc.*, 1953, **12**, 639-646. [Biochem. Inst., Univ. Texas, Austin.]

372

MOSES, W. and JOSLYN, M. A. **The equivalence of thiamine and pyridoxine for a strain of *Saccharomyces cerevisiae*. 1. Effect on growth rate and carboxylase activity. 2. The loss of pyridoxine during growth and the sparing effect**

of thiamin transaminase activity. *J. Bacteriol.*, 1953, **66**, 197-203; 204-209. [Div. Food Technol., Univ. California, Berkeley.]

Experiments with a culture of brewery top yeast showed that vitamin B₁ and pyridoxine could serve alternatively as stimulant for growth. The nutritional conditions in which the equivalence occurred or failed to occur are described in detail. It was concluded, as the most probable explanation, that there is a reversible interrelationship between the two vitamins with pyrimidine as the key intermediate compound.—V. R. Jackson.

373

TRIBE, D. E. and GORDON, J. G. **Choice of diet by rats deficient in members of the vitamin B complex.** *Brit. J. Nutrition*, 1953, **7**, 197-201. [Rowett Res. Inst., Bucksburn, Aberdeenshire.]

Thirty hooded rats of about 100 g. weight were divided into 5 groups. The first had the choice of a basal synthetic diet with or without B vitamins; the position of food pots and diets was changed daily. In the second group, the animals were deprived of B vitamins until signs of deficiency appeared and were then offered the choice of the same two diets. The third and fourth groups were treated like the first, except that the position of the diets but not of the food pots, or of the food pots but not of the diets, was changed daily. The fifth group received a complete diet.

The rats deprived of B vitamins showed a clear preference for the diet containing B vitamins, but it was apparent also from the results in the fourth group that they showed preference for a certain feeding place as well as for a diet. Normal rats showed a less obvious preference for the diet containing B vitamins.

With one exception all the rats were able to differentiate between the diets. Twelve normal human beings failed to do so.—V. R. Jackson.

374

WERTMAN, K., ROTUNDO, R. and YEE, R. **Blood and bone marrow study of vitamin-deficient rats.** *J. Nutrition*, 1953, **50**, 479-485. [Div. Bacteriol., Dept. Biol. Sci., Univ. Pittsburg, Pa.]

Male weanling albino rats received a purified basal diet containing *i*-inositol, *p*-aminobenzoic acid and 2-methyl-1:4-naphthaquinone, alone or supplemented with all B vitamins or all except vitamin B₁. Other animals received the complete diet with intake restricted to maintain weight at the level of the deprived.

Animals on the complete diet to appetite remained healthy and grew well. In the deprived, signs of deficiency appeared after 4 weeks, including failure to gain weight, paraplegia and convulsions and, in those deprived of all B vitamins, loss

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of hair also. At this time total erythrocyte and leucocyte and differential cell counts and films of bone marrow were made.

Vitamin deficiencies and inanition caused leucopenia, but had no significant effect on the erythrocyte count of peripheral blood. The number of neutrophils per c.mm. was not appreciably changed, as there was a percentage increase of these cells. The percentage and number of lymphocytes per c.mm. fell. In general, the number of granulocytes did not differ significantly from that in the normal animals; the number of monocytes, eosinophils and basophils also was normal.

In the bone marrow of the animals deprived of vitamin B₁ or B complex vitamins there was relative granulocytosis with a corresponding increase in younger myeloid cells. In vitamin-deficient animals and animals with inanition there was a relative lymphocytopenia and a slight increase in granulocytes. The number of nucleated red cells was low in those deprived of vitamin B₁. The percentages of other types of cells were not significantly different from those in rats receiving full diet.—V. R. Jackson.

375

SAHASHI, Y. and IWAMOTO, K. **Biochemical studies on vitamin B₁₂. 6. Relation of vitamin B₁ and vitamin B₁₂ to energy metabolism in cattle.** *Proc. Japan Acad.*, 1953, 29, 33-35. [Lab. Biochem., Fac. Agric., Univ. Tokyo.]

Estimations of vitamin B₁ and B₁₂ in the blood, and red cell counts, were made on 2-year-old twin heifers, one of which was made to carry a load of 20 kg. for 4½ hr. on a treadmill while the other remained at rest. During the severe expenditure of energy there was a decrease in both vitamins in the blood with a fall in the red cell count and an increase in the size of the cells. The possible role of vitamins B₁ and B₁₂ in energy metabolism is discussed.—A. M. Copping.

376

DI RAIMONDO, F., MANNINO, N. and ORABONA, M. L. **Inibizione vitaminica dell'antibiosi per antagonismo metabolico. [Inhibition of antibiotics by vitamins through metabolic antagonism.]** Ricerche "in vitro" su *Staph. aureus* con terramicina e tirotricina. [Experiments in vitro with terramycin and tyrothricin against *Staph. aureus*.]

DI RAIMONDO, F., ORABONA, M. L. and ALBANO, O. **Ricerche in vitro su *Pasteurella aviseptica* con streptomycina e terramicina. [Experiments in vitro with streptomycin and terramycin against *Pasteurella aviseptica*.]** *Boll. Ist. sieroterap. milan.*, 1953, 32, 45-51; 52-57. [Ist. Clin. Med., Univ. Bari.] English summary.

Growth of *Staph. aureus* in vitro was almost

completely inhibited by a concentration of 3 µg. tyrothricin per ml. The inhibition was partly overcome by, per ml., vitamin B₁, riboflavin or pyridoxine 1 µg., nicotinamide 0.1 µg. or vitamin B₁₂ 0.01 µg. With terramycin, 5 µg. per ml., the inhibition was more completely overcome by the individual vitamins than with tyrothricin; a concentration per ml. of nicotinamide, pyridoxine or vitamin B₁₂ 1 µg., riboflavin or folic acid 0.1 µg., vitamin B₁ 10 µg., or *p*-aminobenzoic acid 100 µg., all had a considerable effect.

In similar experiments, inhibition of growth of *Pasteurella aviseptica* by a concentration of 5 µg. per ml. of terramycin was partly overcome by concentrations per ml. of nicotinamide, riboflavin or pyridoxine 1 µg., vitamin B₁ or folic acid 10 µg., vitamin B₁₂ 0.1 µg. or pantothenic acid 100 µg. The effect of streptomycin, 5 µg. per ml., was less easily overcome, but some effect was produced by, per ml., pyridoxine, folic acid, nicotinamide or riboflavin 1 µg., vitamin B₁₂ 0.1 µg., or vitamin B₁, *p*-aminobenzoic acid or Ca pantothenate 100 µg. With both drugs the effect of pantothenic acid was the weakest.—E. M. Hume.

377

DI RAIMONDO, F., ORABONA, M. L. and ALBANO, O. **Nutrizione e terapia antibiotica: ulteriori ricerche sulle interferenze tra vitamine del complesso B e penicillina nella infezione stafilococcica sperimentale. [Nutrition and treatment with antibiotics: further studies on antagonism between vitamins of the B complex and penicillin in experimental staphylococcal infection.]** *Boll. Ist. sieroterap. milan.*, 1953, 32, 118-123. [Ist. Clin. Med., Univ. Bari.] English summary.

In experiments with 355 mice a dose of *Staphylococcus aureus* in pig's gastric mucin, sufficient to kill about half the animals, was injected intraperitoneally. At the same time a protective injection of 500 units penicillin was given, and 3 hr. previously one of the B vitamins to be tested was injected. The protective action of penicillin was completely counteracted by pyridoxine (150 µg.), and almost completely by folic acid (150 µg.), nicotinamide (150 µg.) or vitamin B₁₂ (1.5 µg.). Vitamin B₁ (200 µg.), pantothenic acid (250 µg.) or *p*-aminobenzoic acid (250 µg.) exercised very little counteraction, and riboflavin (50 µg.) or biotin (10 µg.) none at all.—E. M. Hume.

378

PONZONI, R., GIBERTI, A. and SPAMPINATO, V. **Sulla morte precoce delle cavie in corso di trattamento aureomicinico. Tentativi di protezione con vitamine dei gruppi B e C e con cortisone. [Premature death of guineapigs being treated with aureomycin. Attempts at**

protection with vitamin B complex, vitamin C and cortisone.] 1. Ricerche batteriologiche. [Bacteriological investigations.]

GIBERTI, A., PONZONI, R. and SPAMPINATO, V. 2. Ricerche istologiche. [2. Histological investigations.] *Boll. Ist. sieroterap. milan.*, 1953, **32**, 239-245; 246-255. [Ist. Microbiol. Igiene, Univ. Modena.] English summary.

1. When 10 guineapigs of about 500 g. weight were given orally 25 mg. aureomycin they all died within 5 days. Daily injection, from the day before administration of aureomycin, of vitamins of the B complex, or of ascorbic acid and vitamin P, or of cortisone had no palliative effect.

2. Histological examination of the organs of guineapigs treated as described above showed that aureomycin caused degeneration and haemorrhagic lesions, especially in the liver, kidneys and adrenal glands, which were somewhat less severe, although fatal, in those treated with the vitamins or cortisone.—E. M. Hume.

379

GUGGENHEIM, K., HALEVY, S., HARTMANN, I. and ZAMIR, R. The effect of antibiotics on the metabolism of certain B vitamins. *J. Nutrition*, 1953, **50**, 245-253. [Lab. Nutrit., Hebrew Univ.-Hadassah Med. Sch., Jerusalem, Israel.]

Weanling male rats received a purified basal diet supplemented with limited amounts of vitamin B₁, riboflavin or pantothenic acid and with the other vitamins in adequate amounts, and were given aureomycin, penicillin, terramycin or streptomycin to the extent of 50 mg. per kg. diet. After 3 and 5 weeks faeces and urine were collected for 3 days and vitamin B₁ in the faeces, and riboflavin and pantothenic acid in the faeces and urine, were estimated.

All the antibiotics stimulated growth in rats partially deprived of riboflavin or pantothenic acid, but only penicillin and terramycin improved growth in vitamin B₁ deficiency. All the antibiotics increased urinary excretion of riboflavin and pantothenic acid; aureomycin, streptomycin and terramycin increased faecal excretion of pantothenic acid, penicillin that of riboflavin.

Penicillin, aureomycin and terramycin increased the amounts of all 3 vitamins in the livers of deprived rats; streptomycin increased riboflavin and pantothenic acid only. In diets with adequate amounts of the vitamin studied, no antibiotic affected the vitamin B₁ content of liver, but aureomycin and penicillin increased the urinary excretion and liver content of riboflavin and pantothenic acid. With adequate amounts of vitamins the antibiotics did not stimulate growth.

When the antibiotics were given subcutaneously to rats partially deprived of a vitamin they did

not stimulate growth or increase the vitamin content of the liver. It is concluded that the effect of antibiotics was due to direct action on the intestinal flora.—V. R. Jackson.

380

CALET, C., RERAT, A. and JACQUOT, R. Action d'épargne des antibiotiques pour quelques vitamines du groupe B. [Sparing action of antibiotics for some vitamins of the B group.] *C.R. Acad. Sci.*, 1953, **236**, 2340-2342.

Four groups of young rats received an adequate synthetic diet, or the diet with only 10 per cent. of the amounts of B vitamins, or the diet with low vitamins but supplemented by 0.016 per cent. procaine penicillin or 0.01 per cent. aureomycin. After 9 weeks, the average daily gain was for the 4 groups, respectively, 2.56, 1.06, 1.36 and 1.62 g. The antibiotics also improved efficiency of food utilisation compared with that of deprived rats, but not to equal the efficiency in rats with an adequate diet. The ratios of liver weight to total weight were increased by the antibiotics over that in normal and deprived rats. Estimation of B vitamins in the liver showed that antibiotics increased the concentration of vitamin B₁₂ but not of riboflavin or nicotinic or pantothenic acid. They increased the total vitamin contents in conditions of deficiency, over those of deprived animals.

It is considered that the favourable effect of antibiotics on the growth of deprived rats is due to their sparing action on the use of the vitamins.

V. R. Jackson.

381

BROWN, J. A., ROBBLEE, A. R. and CLANDININ, D. R. The use of penicillin in breeding rations. *Poultry Sci.*, 1953, **32**, 576-578. [Poultry Div., Univ. Alberta, Edmonton.]

In experiments lasting 336 days, penicillin, when added to 3 practical rations which differed in protein and energy content, had no influence on bodyweight, egg production, efficiency of feed utilisation, fertility or hatching capacity of the eggs. Storage of riboflavin in the liver was not affected.—E. M. Cruickshank.

382

BRIGGS, G. M., HILL, E. G. and CANFIELD, T. H. The need for choline, folic acid, and nicotinic acid by goslings fed purified diets. *Poultry Sci.*, 1953, **32**, 678-680. [Dept. Poultry Husb., Univ. Minnesota, St. Paul.]

Day-old goslings given for 2 weeks purified diets containing adequate amounts of the required vitamins grew as well as birds on a stock ration. When choline, nicotinic acid or folic acid was omitted from the purified diet, growth was retarded within 5 days, and paralysis occurred,

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followed by death. Lack of nicotinic acid or choline caused paralysis of the legs, particularly of the hock joint; lack of folic acid caused cervical paralysis, which was cured by injection of pteroyl-glutamic acid.—E. M. Cruickshank.

383

THAYER, R. H. and DAVIS, J. P. **B-complex vitamin allowances for Oklahoma broiler rations.** *Oklahoma Agric. Exp. Stat. Bull.* No. B-393, March 1953, pp. 11. [Stillwater, Okla.]

New Hampshire chicks received a semi-purified diet or a practical commercial diet containing cereals, minerals, fat-soluble vitamins, vitamin B₁₂ and an antibiotic, each diet being supplemented by graded amounts of riboflavin, nicotinic, pantothenic and folic acids and choline. The chicks were kept in battery brooders and the growth rate was recorded for 4 and 8 weeks.

Satisfactory growth was obtained when the total vitamin content of the diet in mg. per lb. ranged from 5 to 6.5 for riboflavin, 8 to 16 for nicotinic acid, 5 to 6 for pantothenic acid, 1 to 1.5 for folic acid and 700 to 800 for choline. In selecting the amounts to be added the cost of the supplements and the nature of the ingredients were considered. When maize was the principal grain, the higher limit for nicotinic acid was preferred.

V. R. Jackson.

384

ROBBLEE, A. R. and CLANDININ, D. R. **The use of calcium pantothenate and biotin in practical poult starters.** *Poultry Sci.*, 1953, **32**, 579-582. [Poultry Div., Univ. Alberta, Edmonton.]

Of recent years a condition characterised by dermatitis, broken feathers, perosis, diarrhoea and high mortality has been seen in young poults which were receiving rations presumed to be adequate. In the present experiments addition to the breeder ration of calcium pantothenate or buttermilk had no effect on the incidence of the disease. Since the signs appeared to become more severe as the breeding season progressed, both early and late hatched poults were used for a test. They were given for 4 weeks a practical basal ration containing maize, wheat, oat and barley meals, wheat by-products, alfalfa meal, herring meal, meat scrap, soya bean meal, minerals and vitamins A and D with added riboflavin, nicotinic acid and choline. With this ration signs of deficiency appeared between 2 and 4 weeks of age. Addition to the ration of calcium pantothenate decreased mortality and improved growth in poults hatched in the early, but not in the late, part of the season, but the incidence of the other abnormalities was not reduced. A further

addition of folic acid was without effect, but a combination of calcium pantothenate and biotin greatly reduced the incidence of the disorder.

E. M. Cruickshank.

385

ADRIAN, J. Contingence ou autonomie de l'oeuf de poule vis-à-vis de l'équilibre vitaminique de la mère. Cas des surcharges en acide pantothenique et en niacine. [**Dependence or independence of the hen's egg on the vitamin balance of the hen. Test administration of pantothenic and nicotinic acids.**] *C.R. Acad. Sci.*, 1953, **237**, 273-274.

Six hens received for 2 weeks a diet containing per kg. 14 mg. Ca pantothenate and 100 mg. nicotinic acid, and then for 2 weeks a diet with 375 mg. Ca pantothenate and 1250 mg. nicotinic acid. The two vitamins were estimated in the eggs.

When the vitamin supplements were increased there was a 15 per cent. increase of the nicotinic acid content of the egg followed by a fall to the original value; pantothenic acid increased 3.5 times. During the first period the percentage of ingested nicotinic acid and pantothenic acid retained in the egg was 35 and 0.17, respectively, and during the second period 4.5 and 0.016. The maximum values obtained for the egg were 7 mg. per cent. for pantothenic acid and 0.1 mg. per cent. for nicotinic acid.—V. R. Jackson.

386

KON, S. K. and PORTER, J. W. G. **The B vitamin content of the rumen of steers given various diets.** *Proc. Nutrit. Soc.*, 1953, **12**, xii. [Nat. Inst. Res. Dairying, Univ. Reading.]

387

MOINUDDIN, M., POPE, A. L., PHILLIPS, P. H. and BOHSTEDT, G. **The effect of ration on the riboflavin, niacin, and vitamin B₁₂ concentration of blood and milk of sheep.** *J. Animal Sci.*, 1953, **12**, 497-506. [Dept. Animal Husb., Univ. Wisconsin, Madison.]

Four groups of 10 ewes were given basal diets differing in protein and mineral composition during late gestation and throughout lactation. Blood samples were taken at parturition and again 6 weeks later, and milk samples and blood samples from lambs at intervals for the first 6 weeks. No significant difference was found in the values for nicotinic acid and riboflavin in the blood or milk of the ewes or the blood of their lambs. The content of riboflavin in the ewes' blood decreased as lactation progressed but that of nicotinic acid remained constant. The content of both vitamins decreased in the lambs' blood.

A year later the same 40 ewes were given diets with or without supplements of cobalt and

bonemeal, and the vitamin B₁₂ content of the blood and milk was examined. At parturition the vitamin B₁₂ content of the blood was about the same in all groups, but subsequently the values rose in the ewes having Co in the diet. The vitamin B₁₂ content of the lambs' blood was higher also when the ewes received Co and was related to a higher vitamin B₁₂ potency of the milk in groups having Co. When both Co and bonemeal were present in the diet the amount of vitamin B₁₂ in the blood appeared to be increased, but supplements of Ca and P did not affect the amount of vitamin B₁₂ in the blood.

The change in all 3 vitamins in the blood of lambs from birth to from 6 to 8 weeks of age is considered to be evidence of placental transfer. It is suggested that routine supplements of Co should be given to pregnant ewes in order to assure an adequate supply of vitamin B₁₂ for growth and haemopoiesis.—A. M. Copping.

388

SMITH, Q. T. and ALLEN, R. S. **B-Vitamin levels in the blood of young dairy calves fed a milk replacement diet with and without aureomycin.** *J. Dairy Sci.*, 1953, **36**, 593. *Proc.* [Iowa State Coll., Ames.]

389

BOMAN, T. J. **Microbiological assay of vitamin B complex including folic acid in buffalo milk.** *Indian J. Dairy Sci.*, 1953, **6**, 41-45. [Pub. Health Lab., Poona.]

B vitamins were estimated microbiologically in 10 samples of buffalo milk. Average values in $\mu\text{g.}$ per ml. were for riboflavin 1.02, nicotinic acid 2.6, biotin 0.133, pantothenic acid 1.5, vitamin B₁ 0.5, vitamin B₆ 3.25, *p*-aminobenzoic acid 26.75, and folic acid 5.5. Buffalo milk is, therefore, a good source of most of the B vitamins. Exposure of milk to diffuse light for 6 hr. reduced the riboflavin content to 0.48 $\mu\text{g.}$ per ml., and in sunlight it fell to 0.18.—V. R. Jackson.

390

THOMAS, K., PACE, J. K. and WHITACRE, J. **Effect of enrichment on the thiamine, riboflavin and niacin content of corn meal and grits as prepared for eating.** *Texas Agric. Exp. Stat. Bull.* No. 753, October 1952, pp. 30.

Yellow and white maizemeal and flour (grits) with the germ removed were enriched with commercial mixtures of vitamin B₁, riboflavin and nicotinic acid, and were made into bread, pone, spoonbread, mush and boiled or fried grits, by standard recipes. Vitamins were estimated before and after cooking the mixtures and the results were compared with those for non-enriched meal and grits.

Grits contained a negligible amount of vitamin B₁; enrichment increased the amount of riboflavin and nicotinic acid by 5 and 7 times, respectively. There were no differences in percentage retention of any of the vitamins during cooking of non-enriched and enriched meals or grits.

No vitamin B₁ was lost from mush or from grits boiled for 30 min., but further boiling for from 4 to 7 hr. caused the loss of up to one-third. Frying caused only a slight loss. In maize bread made with sweet or sour milk and small amounts of leaven, retention was from 84 to 89 per cent., the pH of the batter being from 5.4 to 6.2. With higher pH due to high leavening, only 7 per cent. was retained. In pone and spoonbread retention was high over the whole range of pH values used.

The compulsory enrichment of maizemeal and grits in Texas is recommended.—V. R. Jackson.

391

PACE, J. K. and WHITACRE, J. **Factors affecting retention of B vitamins in corn bread made with enriched meal.** 1. The relation of pH to the retention of thiamine, riboflavin, and niacin in corn bread. 2. Relation of crust and crumb and of baking utensil to retention of thiamine in corn bread. 3. Retention of thiamine in corn muffins made with commercial mixes and in corn bread made with self-rising meals. *Food Res.*, 1953, **18**, 231-238; 239-244; 245-249. [Dept. Rural Home Res., Agric. Exp. Stat., College Station, Tex.]

1. Procedures were as described by Thomas *et al.* (see preceding Abst.). Maizemeal without germ was enriched with vitamin B₁, riboflavin and nicotinic acid. Retention of the vitamins was studied during cooking of maize bread made to a standard recipe; the pH was varied in the uncooked batter made with sour milk by increasing the amount of soda, and in the breads made with sweet milk by varying the amount of baking powder.

The pH of bread rose during baking, the rise being greater with higher initial values. The retention of vitamin B₁ was best, from 80 to 89 per cent., when the initial pH was not more than 6 and the final pH was therefore not more than 6.6. Great variations in retention occurred when the pH of the batter was between 6 and 6.45; when the pH of the batter was 6.6 and that of the bread between 7.2 and 8.9, all the vitamin was lost. Excess of baking powder did not cause much loss of vitamin B₁ since the pH remained the same and the bread did not become alkaline. The percentage retention ranged from 82 to 85 per cent. for 3 types of baking powder. Loss appeared to be due only to increasing amounts of soda in the standard recipe.

Percentage retention of nicotinic acid was from 95 to 96 and of riboflavin 102.

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2. Maize bread, muffins and sticks made from enriched meal by a standard sour milk recipe were baked for 30 min. at 215° C. in utensils of tin, aluminium, pyrex or iron. Crust and crumb were removed and the retention of vitamin B₁ was estimated by the thiochrome method in comparison with the uncooked batter.

The type of utensil had no effect on the amount of vitamin B₁ retained. The percentage of the products represented by crust was 30 for loaves, 40 for muffins and 68 for sticks. The average percentage retention of the vitamin was 85, 79 and 66, respectively, showing that the loss increased as the total surface area of the batch increased. The differences in retention are considered to be of practical importance and, where the dietary supply of the vitamin is a problem, loaves are preferable to muffins and muffins to sticks.

3. Maize bread and muffins were prepared from 5 brands of muffin "mix" and from one each of whole and bolted self-raising meal. Vitamin B₁ was estimated in the mixes, meals, batters and baked products.

The quality of the baked products varied considerably. The vitamin B₁ content of the mixes and meals also varied, the highest value being 10 times that of the lowest. Batters too showed a wide variation.

The percentage retention in muffins ranged from 31 to 74. As before, it was related to the pH of the batter and muffin, retention being poor in batters with high pH giving a value for the bread at or above neutral. Muffins made from meal enriched in the laboratory retained from 79 to 84 per cent. It appeared, therefore, that the baking powders used in the mixes were not as well balanced as those used in the standard recipes.

Maize bread made from sour milk and self-raising whole or bolted meal retained 80 and 83 per cent. of vitamin B₁, respectively. Corresponding values when sweet milk was used were 69 and 46.—V. R. Jackson.

392

SIMPSON, I. A., CHOW, A. Y. and SOH, C. C. **The distribution of thiamine and riboflavin in the mung bean; and the changes that occur during germination.** *Cereal Chem.*, 1953, **30**, 222-229. [Inst. Med. Res., Kuala Lumpur, Malaya.]

Samples of mung bean (*Phaseolus aureus*) were germinated for up to 48 hr. at about 28° C., about half the time in the dark and at no time in direct sunlight. Vitamin B₁ and riboflavin were estimated fluorimetrically in dormant beans and after 8, 20 and 48 hr. Photographic examination was made of 3 sections of the beans after treatment with ferricyanide by the method of Simpson (Abst. 3387, Vol. 21).

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Both vitamins decreased during the initial stages of germination, but after 20 hr. vitamin B₁ had slightly, and riboflavin had greatly, increased above the amounts in the dormant bean. Photographic examination showed that vitamin B₁ was concentrated in the cells of the germ and adjacent cotyledons. During germination there was diffusion through the cotyledons, possibly through translocation by absorbed water with concentration in the cell wall of the young shoot. Riboflavin was more generally dispersed through the cotyledons with higher concentrations in the radicle; it appeared to develop in cells of the young shoot. Certain cells in the cotyledons, possibly those of the vascular bundles, were richer in both vitamins.—V. R. Jackson.

393

LEONG, P. C. **The nutritive value of coconut toddy.** *Brit. J. Nutrition*, 1953, **7**, 253-259. [Dept. Chem., Univ. Malaya, Singapore.]

Coconut toddy, the partly fermented sap of *Cocos nucifera*, is a popular beverage in south-east Asia and the central Pacific islands, and is believed, without much evidence, to be a good source of B vitamins.

Samples from a government toddy-shop in Singapore contained about 5 per cent. of alcohol by volume and had the following mean composition in g. per 100 ml.; ash 0.28, crude protein (N × 6.25) 0.22, crude fat 0.04, invert sugar 1.94, sucrose 1.13, acidity as acetic acid 0.42; the calculated energy value was about 270 Cal. per pint.

Since toddy contains live yeast cells and much of the vitamin B₁ and riboflavin in live yeast is not thought to be available to man (cf. Abst. 3607, Vol. 15), toddy was centrifuged and the yeast cells and the liquid portion were investigated separately. Vitamin B₁ was estimated by the thiochrome method, riboflavin by a modification of the fluorimetric method of Barton-Wright and Booth (Abst. 1073, Vol. 13), and nicotinic acid by that of Friedemann and Frazier (Abst. 1725, Vol. 20).

Nearly all the vitamin B₁ and 75 per cent. of the riboflavin were in the yeast cells, but the liquid contained 59, 96 and 70 per cent., respectively, of the nicotinic acid, Ca and Fe. The liquid and the cells from 100 ml. toddy contained, respectively, on the average, in µg., vitamin B₁ 0.3 and 23.6, riboflavin 2.7 and 8.1, nicotinic acid 218 and 151, Ca 460 and 21 and Fe 228 and 96; 100 and 40 per cent., respectively, of the Fe was ionisable. Fe is perhaps partly supplied by the containers.

It is concluded that a pint of coconut toddy supplies only negligible proportions of the daily human requirement of vitamin B₁, riboflavin and Ca, but about 10 per cent. of the requirement of nicotinic acid and Fe.—W. M. Deans.

See also Absts. 240, 557.

VITAMIN B₁ (ANEURIN, THIAMINE)

394

MACCAGARO, G. A. and LUGLI, A. M. Premesse sperimentali al dosaggio della tiamina con un ceppo di *Escherichia coli*. [Estimation of vitamin B₁ with a strain of *Bacterium coli*.] *Boll. Soc. ital. Biol. sper.*, 1953, **29**, 181-184. [Ist. Igiene, Univ. Pavia.]

A strain, K12, of *Bacterium coli*, incapable of growing without vitamin B₁, was selected. The test organism was grown on plates in an agar medium with minerals and glucose, in which cups 8 mm. in diameter were cut. The test organism was incorporated in the agar, and vitamin B₁ in different concentrations was introduced into the cups, round which the zones of multiplication could be measured. The lowest concentration of vitamin B₁ at which growth was visible was from 10⁻⁶ to 10⁻⁵ µg. per ml. The relation between the log of the concentration and the diameter of the zone of multiplication was linear for concentrations between 10⁻⁴ and 1 µg. per ml. With hydrolysates of casein, nucleosides, or the vitamin B complex without vitamin B₁, there was no growth.

E. M. Hume.

395

BANDELIN, F. J. and TUSCHHOFF, J. V. Colorimetric determination of thiamine in pharmaceutical products. *Anal. Chem.*, 1953, **25**, 1198-1200. [Res. Labs., Flint, Eaton and Co., Decatur, Ill.]

The method was found suitable for materials containing high concentrations of vitamin B₁, since dilution was not necessary. Ammonium reineckate precipitated vitamin B₁ from aqueous solution and in the presence of nicotinic acid, nicotinamide and pyridoxine, vitamin B₁ reineckate could be selectively precipitated in buffer solution at pH 4.5. The precipitated vitamin B₁ reineckate was dissolved in acetone and estimated by spectrophotometric measurement at 525 mµ. Accuracy was within ± 2 per cent.—R. Marshall.

396

COURTEIX, M. J. Sur le dosage de la vitamine B₁: précision de la méthode au thiochrome. [Estimation of vitamin B₁: precision of the thiachrome method.] *Ann. pharm. franç.*, 1953, **11**, 279-283. [Soc. des Usines Chim. Rhône-Poulenc, Lab. Recherches Anal., Vitry-sur-Seine.]

A study of the errors inherent in the making up of the solutions needed for the thiochrome estimation of vitamin B₁ (U.S.P. XIV and Pharmacopoeia Internat. I) and in the fluorimetric readings, visual or photo-electric, showed that these methods

cannot be used for work which requires that the potency found should be at least 98 per cent. of the potency claimed.—K. H. Coward.

397

PARTINGTON, H. and WATERHOUSE, C. E. The stability of aneurine hydrochloride in pharmaceutical preparations. *J. Pharm.*, 1953, **5**, 715-722. [Res. Dept., Bob Martin, Ltd., Southport.]

Vitamin B₁ hydrochloride in relatively dry media was stable for long periods, even for several years, at pH 4. A loss of about 10 per cent. in tablets of pH from 4.0 to 5.0 occurred soon after manufacture. In media of higher pH there was greater loss which, at pH 6.5, might amount over years to as much as 33 per cent. At higher pH values almost all the vitamin disappeared. Relatively high concentrations of Cu appeared to have little effect on the dry media when stored at room temperature even for long periods.

K. H. Coward.

398

FARRER, K. T. H. The thermal destruction of vitamin B₁. Studies with aneurin mononitrate. *Austral. J. Exp. Biol. Med. Sci.*, 1953, **31**, 247-254. [Res. Labs., Kraft Foods, Ltd., Melbourne.]

Vitamin B₁ as the mononitrate or hydrochloride was estimated by the Jansen thiochrome method in buffer solutions at 100° C. and also in yeast extract to which the mononitrate or hydrochloride was added so that the natural vitamin was about 5 per cent. of the total.

The mononitrate behaved similarly to the hydrochloride but was less stable in the buffer solutions.

Processed cheese, fortified with the mononitrate to provide 96 per cent. of the total vitamin, was stored at temperatures from 21° to 65° C. and estimations were made at intervals. The mononitrate appeared slightly more stable than the hydrochloride, but their behaviour was much the same.—V. R. Jackson.

399

MATSUKAWA, T. and YURUGI, S. On a new derivative of thiamine with cysteine. *Science*, 1953, **118**, 109-111. [Res. Lab., Takeda Pharmaceutical Industries, Ltd., Osaka.]

A new compound, vitamin B₁ cysteine, was demonstrated by paper partition chromatography of a mixture of vitamin B₁ with cystine or of vitamin B₁ disulphide with cysteine. A mechanism is suggested, in preference to the redox system of

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Zima and Williams (Abst. 1085, Vol. 12), for the catalytic action of vitamin B₁ in the living body, involving an equilibrium reaction. The action of vitamin B₁ is thought to be due to its dehydrogenating or oxidative action on certain substrates which are affected when vitamin B₁ cysteine or its homologues, produced in the equilibrium reaction, revert to their original components.

V. R. Jackson.

400

SUZUOKI-ZIRÔ and SUZUOKI-TUNeko. **The concentrative uptake of thiamine alkyl disulfides by rabbit or chick blood cells.** *J. Biochem., Tokyo*, 1953, **40**, 11-20. [Res. Lab., Takeda Pharmaceutical Industries, Ltd., Osaka.]

The authors found that alkyl disulphides of vitamin B₁ had almost the same activity for rice birds as vitamin B₁ (unpublished). In the present work it is shown that they were taken up *in vitro* by the blood cells of rabbits or chicks to reach a considerable concentration within the cell. Vitamin B₁, its disulphide and pyrophosphate were not taken up at all. The alkyl disulphides of vitamin B₁ are fat-soluble, and it is considered that they could diffuse through the lipid membrane of the cell.—E. M. Hume.

401

YOSHIDA, S. and OKAJIMA, Y. [Studies on the allied compounds of vitamin B₁. 7. Cyanoethylation of 2-mercaptothiazole derivatives.]

YOSHIDA, S. and UNOKI, M. [8. Structure of N-substituted dithiourethanes. (1). 9. Structure of N-substituted dithiourethanes. (2).] *J. Pharm. Soc. Japan*, 1953, **73**, 171-173; 174-176; 261-264. [Takamine Res. Lab., Sankyo Co., Ltd., Tokyo.] English summary.

402

MATSUKAWA, T. and YURUGI, S. [Studies on vitamin B₁ and related compounds. 40. Chemical change of allithiamine.]

MATSUKAWA, T. and KAWASAKI, H. [41. Synthesis of allithiamine homologues. (1).]

MATSUKAWA, T. and HIRANO, H. [42. Action of hydrogen peroxide on 3-(2'-methyl-4'-amino-pyrimidyl-5')-methyl-4-methyl-5-β-hydroxyethylthiazole-2-thion.]

MATSUKAWA, T. and KAWASAKI, H. [45. Thioltype thiamine derivatives (1). 46. Thioltype thiamine derivatives (2).]

KAWASAKI, H. [47. Synthesis of allithiamine homologues (3).] *J. Pharm. Soc. Japan*, 1953, **73**, 73-75; 216-219; 379-382; 705-708; 709-712; 712-716. [Res. Lab., Takeda Pharmaceutical Industries, Ltd., Osaka.] English summary.

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403

SILIPRANDI, D. and CICCARONE, P. **The action of diphosphothiamine on glucose tolerance.** *Acta med. scand.*, 1953, **146**, 146-147. [Inst. Biol. Chem., Univ. Rome.]

Estimations of blood sugar were made at 20 min. intervals in normal rabbits fasted for 24 hr., after receiving 1 g. glucose per kg. alone or with 15 mg. diphosphothiamine per kg. or 0.5 I.U. insulin per kg., or both.

Glucose tolerance was significantly increased by diphosphothiamine but not as much as by insulin. Administration of both together suggested that the effect of insulin was enhanced.—V. R. Jackson.

404

RINDI, G. **Attività transaminasica di alcuni tessuti di ratti in avitaminosi B₁. [Transaminase activity of certain tissues of rats deprived of vitamin B₁.]** *Boll. Soc. ital. Biol. sper.*, 1953, **29**, 170-173. [Ist. Fisiol., Univ. Pavia.]

Of 3 groups of rats of from 50 to 60 g. weight fed on a diet deficient in vitamin B₁, 2 groups had vitamin B₁ added, of which one was fed to appetite and the other restricted to the consumption of the deprived group. The rats were killed after from 18 to 22 days. The glutamic-oxalacetic transaminase activity of homogenates of the liver, heart, muscles and brain was estimated in the conversion of a mixture of L-aspartate and ketoglutarate to oxalacetate and L-glutamate. The transaminase activity was high in the rats deprived, and restricted but not deprived, so that the effect was caused by inanition and not by deprivation.—E. M. Hume.

405

BACCARI, V., GUERRITORE, A. and VANTAGGI-COZZARI, L. **Sull'attivazione da vitamina B₁ nella trasmetilazione da metionina ad acido guanidinacetico. [Activation by vitamin B₁ in the transmethylation of methionine to guanidoacetic acid.]** *Boll. Soc. ital. Biol. sper.*, 1952, **28**, 1920-1921. [Ist. Chim. Biol., Univ. Perugia.]

With a technique previously described (*ibid.*, 1952, **28**, 609), it was shown that when the transformation *in vitro* of DL-methionine to guanidoacetic acid by rat liver emulsion was activated by vitamin B₁, there was no change in the consumption of O₂.—E. M. Hume.

406

LORENZINI, R., BOSCHI, S. and BENEDETTI, A. **Azione catalitica della cocarbossilasi nei processi di trasmetilazione. [Catalytic action of cocarboxylase in transmethylation processes.]** *Acta vitaminol.*, 1953, **7**, 141-142.

[Ist Clin. Med. Gen., Univ. Modena.] French, English, German and Spanish summaries.

Administration of 5 mg. vitamin B₁ or of 10 mg. cocarboxylase to 5 adult rats on a normal diet caused similar increases in excretion of methyl-N¹-pyridine compounds in the urine. In man increased excretion of methyl derivatives was found after intramuscular injection of 50 mg. cocarboxylase or vitamin B₁.—A. M. Copping.

407

OGATA, K., SHIMIZU, T. and ENOKI, C. **Studies on the metabolism of acid-soluble and acid-insoluble phosphate compounds in the liver of normal and thiamine-deficient rats.** *J. Biochem., Tokyo*, 1953, **40**, 141–150. [Dept. Biochem., Sch. Med., Univ. Niigata.]

Comparable groups of rats weighing about 70 g. were given a complete synthetic diet, a diet lacking in vitamin B₁ or the diet with vitamin B₁ but restricted in amount to that eaten by the deprived group. When signs of severe deficiency appeared, all the rats were starved for 12 hr. and then given an injection of disodium phosphate containing ³²P one hr. before they were killed. The livers were immediately removed and the acid-soluble and acid-insoluble phosphates were fractionated.

The distribution of ³²P showed no apparent change except in the lipid fraction where the values were low in rats deprived of vitamin B₁. Analysis for distribution of relative specific activity in terms of ³²P, however, indicated that in the deprived rats there was a significant decrease in the rate of turnover of labile P in the adenosine-triphosphate and -diphosphate fractions and in the lipid ribonucleic and deoxyribonucleic acid P. Cure of the deficiency by administration of vitamin B₁ restored the distribution of ³²P in the liver to some extent, but not completely in respect of the acid-insoluble fractions.—A. M. Copping.

408

SMYSLOVA, G. I. **[Effect of vitamin B₁ on the catalase content of the blood of normal rabbits and of those infected with *Staphylococcus aureus*.]** *Trudy Vses. Obsch. Fiziol., Biokhim. Farmakol.*, 1952, No. 1, 114.

409

CASELLA, C. and DE CARO, L. G. **Conduzione e potenziale d'azione nel nervo di ratto in avitaminosi B₁. [(Rate of conduction and action potential of nerve in rats deprived of vitamin B₁.)]** *Arch. Sci. biol., Bologna*, 1953, **37**, 229–236. [Ist. Fisiol., Univ. Pavia.]

Even when grave neurological signs of vitamin B₁ deficiency were present, the rate of conduction and action potential were normal in the sciatic nerve.—I. Leitch.

410

WAIBEL, P. E., CRAVENS, W. W. and BAUMANN, C. A. **Effect of dietary antibiotics on the growth of chicks receiving suboptimum amounts of thiamine by mouth or by injection.** *J. Nutrition*, 1953, **50**, 441–450. [Dept. Poultry Husb., Coll. Agric., Univ. Wisconsin, Madison.]

Day-old chicks received for from 11 to 28 days the vitamin-B₁-deficient diet described by Robblee *et al.* (Abst. 3767, Vol. 18), carbohydrate being either sucrose or dextrin, supplemented orally by 1.0, 1.5 or 6.0 µg. vitamin B₁ per g. diet. With each dose one group received no further supplement, and another got 35 p.p.m. aureomycin or 15 p.p.m. penicillin. With the largest amount of vitamin B₁, the antibiotics increased growth by 9.5 per cent., and with 1.5 µg. per g. growth was increased by 50 per cent. by aureomycin and 69 per cent. by penicillin; with 1.0 µg. per g. the increase was 45 and 57 per cent., respectively, and the survival time also was increased. Utilisation of feed was more efficient when antibiotics were given. A mixture of penicillin, aureomycin, bacitracin and streptomycin was as effective as penicillin alone. The effects were not observed when vitamin B₁ was given subcutaneously, and differences in weight between the groups were much less.

Replacement of 1 per cent. carbohydrate in the diet by glycerol improved the stability of vitamin B₁ in the diets. It is concluded that vitamin B₁ was used as efficiently from the diet as when injected if losses caused by instability before ingestion or by the activity of the intestinal flora were avoided. As much as 5 per cent. glycerol had no adverse effect on the growth of the chicks or their efficiency of feed utilisation.

V. R. Jackson.

411

CACIOPPO, F. **Comportamento della cocarbossilasi (APP) nelle uova di pollo durante il periodo di incubazione. [Behaviour of cocarboxylase (APP) in hen's eggs during incubation.]** *Boll. Soc. ital. Biol. sper.*, 1952, **28**, 1966–1968. [Ist. Chim., Fac. Med., Univ. Naples.]

It had been shown previously that the content of vitamin B₁ in the hen's egg declined rapidly on incubation (Abst. 4222, Vol. 23). Cocarboxylase was estimated by the method of Westenbrink (Abst. 2936, Vol. 11) in 94 eggs of White Leghorn hens before and at intervals up to the 18th day of incubation. The content of cocarboxylase was low before incubation but immediately increased to an extent corresponding with the great decrease in free vitamin B₁. From that point of maximum increase it decreased gradually, but even by the 18th day was still considerably higher than before incubation.—E. M. Hume.

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412

- D'AGOSTINO BARBARO, A. La vitamina B₁ fattore di accrescimento *in vitro* per gli infusori ciliati del rumine. [Vitamin B₁ as a growth factor for ciliate infusoria of the rumen *in vitro*.] *Boll. Soc. ital. Biol. sper.*, 1952, **28**, 2026-2029. [Ist. Chim. Biol., Univ. Messina.]

Vitamin B₁ in concentrations ranging from 5×10^{-10} to 5×10^{-8} was added to samples of the rumen contents from a goat. In all concentrations the ciliate infusoria survived and maintained their mobility somewhat longer than when no vitamin B₁ was added.—E. M. Hume.

413

- AOYAMA, S. Studies on the thiamin decomposing bacterium. 2. The characteristics of thiaminase of *Bacillus aneurinolyticus* Kimura et Aoyama.
- LIAO, T. H. 3. Immunological studies on *Bacillus aneurinolyticus* Kimura et Aoyama. *Acta Scholae med. Univ. Kioto*, 1953, **30**, 239-244; 270-273. [Microbiol. Inst., Fac. Med., Univ. Kyoto.]

414

- SARACOGU, S. The thiamine content of Turkish wheats and corresponding bulgurs. *Cereal Chem.*, 1953, **30**, 323-327. [Fac. Sci., Univ. Ankara, Turkey.]
- Twenty-eight varieties of hard, soft and mixed

wheats and of *bulgurs* made from them were collected in different regions of Turkey from 1947 to 1951, and estimations were made of moisture and of vitamin B₁ by the thiochrome methods. *Bulgur* is prepared from wheat grain by washing, boiling to gelatinise the starch, air-drying, crushing and, usually, winnowing to remove the hulls and sieving of the fine parts after crushing.

Wheat and *bulgur* contained 9.2 per cent. moisture. The vitamin B₁ content of wheat ranged from 3.11 to 5.04 μg . per g. with average 3.89 and of *bulgurs* from 1.44 to 3.57 with average 2.83. The figures are expressed on a basis of 14 per cent. moisture. The percentage of vitamin B₁ lost during conversion of wheat to *bulgur* ranged from 8.9 to 42.4, average 27.3. The greatest loss, averaging 22.6 per cent., occurred in the boiling, partly by destruction and partly by leaching, and was influenced by the variety, the proportions of wheat and water, the pH value, and the duration and manner of boiling. The fine fraction, removed in some regions by sieving, amounted to 10 per cent. and was the portion richest in vitamin B₁. The weight of the hulls was negligible compared with that of the grain, so that their removal caused little loss of vitamin. The hulls contained 3.18 μg . per g.

Measures for producing *bulgurs* of high vitamin B₁ content, including enrichment, are discussed.

V. R. Jackson.

See also Abst. 375.

RIBOFLAVIN

415

- CLARKE, M. F. Media used for microbiological assay of riboflavin using *Lactobacillus casei*. Method of assay and confidence limits attainable. *Anal. Chem.*, 1953, **25**, 1247-1252. [Dept. Chem., Med. Coll. Virginia, Richmond.]
- A series of media were obtained by modifying 3 standard media, those of Greene and Black, U.S.P. and Roberts and Snell. The constituents varied were glucose content, growth stimulants and buffer.

Dose-response curves for the modified media are compared with those for the original media. For certain of the modified media there exists a linear relationship between response (titratable acidity) and the logarithm of the dose over a wide range of dose. This permits a statistical analysis of the standard curves to be made by established methods and results of such analyses are given for 4 of the most promising media and used to assess their relative merits.

Concentrates were assayed by each of the 4 media in turn and results are given for one such assay on a given sample of Sirup of Pantabee.

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Confidence limits for potency are given. Agreement between values obtained with the different media was good.

In a final discussion, previous work is reviewed and the advantages of the new media are urged.

G. T. Park.

416

- HERRERA AVALOS, T. Valoración microbiológica de la riboflavina. [Microbiological estimation of riboflavin.] *An. Fac. Farm. Bioquím., Lima*, 1951, **2**, 66-70. [Lab. Bioquím. Gen., Univ. Nac. Mayor de San Marcos, Lima.]

Values were determined microbiologically for the riboflavin content of blood from 28 normal subjects, 32 samples from a blood bank and a dispensary, and from 10 patients. The range for the healthy was from 0.22 to 0.30 μg . per ml. and for the sick from 0.24 to 0.35.—I. Leitch.

417

- POVOLOTSKAYA, K. L. and SKOROBOGATOVA, E. P. Sopotavlenie khimicheskogo i mikrobiologicheskogo metodov opredeleniya riboflavina v rastitel'nom materiale. [Comparison

of chemical and microbiological methods for estimating riboflavin in plant materials.] *Biokhimiya*, 1953, 18, 79-88. [Vses. Nauch-Issled. Vitamin. Inst., Moscow.]

It has been shown experimentally that when a fluorimetric method is used for estimating riboflavin, it is essential that the fermentation stage is not omitted as is done in the methods described by Hoffer, Alcock and Geddes (Abst. 308, Vol. 15), by Arnold (Abst. 3203, Vol. 15) and in *Methods of Vitamin Assay* (Abst. 2976, Vol. 21). To determine the extinction point of the fluorescence by addition of sodium hydrosulphite is particularly important. A solution of riboflavin of known concentration estimated independently should be used as a standard. When the microbiological method used is that of Snell and Strong (Abst. 2944, Vol. 9) incubation should be continued for 48 hr. after inoculation. Centrifuging of the seeded material can be replaced by simple decantation. Good results were obtained with both acidimetric and turbidimetric methods but acidimetry is recommended. Riboflavin was estimated by chemical and microbiological methods in a number of materials and good agreement of the results was obtained. The results indicated that it is only with plant materials rich in pigments, such as the dog rose or pollen, that it is essential to use microbiological methods.—W. Hughes.

418

ALBERT, A. Quantitative studies of the avidity of naturally occurring substances for trace metals. 3. Pteridines, riboflavin and purines. *Biochem. J.*, 1953, 54, 646-654. [Dept. Med. Chem., Austral. Nat. Univ., Canberra.]

The avidities were recorded, in the form of stability constants of natural and synthetic pteridines, riboflavin, some natural purines, and 8-hydroxyquinoline and its sulphonic acid derivative, for ions of bivalent heavy metals. These substances all combined with metals through a hydroxyl group *peri* to a ring nitrogen atom, the avidity being usually in a graded and descending series from Cu through Ni, Co, Fe, Mn to Mg. Two different patterns were demonstrated in the stages of combination. Riboflavin appeared to have a relatively high avidity for ferrous iron and the fact is discussed in relation to association of metallic ions with enzymes containing this vitamin. Riboflavin was not reduced by ferrous and did not combine with ferric iron. High affinity for Fe was shown also by the purines, especially guanosine. Adenosine with no acidic group had no affinity for metals. Pteroylglutamic acid had a low affinity for Cu; in the lower pH ranges it formed highly insoluble salts with all the metals.

The colours of the complexes are described.

V. R. Jackson.

419

GIROUD, A., LÉVY, G. and MARTINET, M. Les cataractes foetales après thyroxine sont-elles liées à une carence. [Are foetal cataracts after thyroxine related to a deficiency?] *C.R. Soc. Biol.*, 1953, 147, 402-404.

Female rats received a standard basal diet and, after 9 days of gestation, 0.5 mg. thyroxine daily. They were killed after 21 days and pantothenic acid and riboflavin were estimated in the livers.

There was no difference in pantothenic acid content between livers from normal pregnant rats and those receiving thyroxine but in the latter group there was a considerable fall in riboflavin. It is concluded that the previously reported occurrence (Giroud and Rothschild, *Bull. Soc. Ophthal. France*, 1951, p. 543) of foetal cataract when the mothers had received thyroxine may have been due to induced riboflavin deficiency although in tests designed to produce them no eye lesions appeared in the mother or foetus.—V. R. Jackson.

420

DE BASTIANI, G., SPERTI, L. and ZATTI, P. Azione diabetogena della vitamina B₂ nel ratto albino. [Diabetogenic action of riboflavin for the albino rat.] *Boll. Soc. ital. Biol. sper.*, 1953, 29, 229-231. [Ist. Fisiol., Univ. Padua.]

Of 3 groups each of 30 rats weighing about 150 g., riboflavin was given to one intravenously and to one intraperitoneally in a single dose of 40, 60 or 80 mg. per kg. bodyweight. Blood sugar was estimated in a tolerance test with 5 g. glucose per kg. bodyweight. The third group received 100 mg. riboflavin by intramuscular injection daily for 10, 15 or 20 days. Most of the rats given 80 mg. by intravenous or intraperitoneal injection died. A few of the survivors injected intravenously failed to show any effect but the majority showed signs of diabetes including changes in the pancreas. Of the survivors injected intraperitoneally none showed signs of diabetes. The rats given daily intramuscular injections of 100 mg. riboflavin per kg. bodyweight showed a steadily rising value for the fasting blood sugar which gradually declined on cessation of treatment with riboflavin.—E. M. Hume.

421

CHICHIZOLA, O. Y. Influencia de la riboflavina sobre la diabetes aloxánica del conejo. [Effect of riboflavin on alloxan diabetes in the rabbit.] *An. Fac. Farm. Bioquim., Lima*, 1951, 2, 610-618. [Lab. Farmacol., Univ. Nac. Mayor de San Marcos, Lima.]

Intravenous injection of riboflavin into rabbits made diabetic with alloxan caused a gradual fall of the elevated blood sugar value. The rate of

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decrease was related to the dose of riboflavin. The possible use of riboflavin as an adjuvant to insulin in the treatment of human diabetes is discussed.—A. M. Copping.

422

SARACOĞLU, S. and BABADAĞ, T. Über den Vitamin-B₂-Gehalt türkischer Weizen und dessen Veränderung bei der Herstellung von Bulgur. [Riboflavin content of Turkish wheat and its changes during the making of bulgur.] *Ztschr. Lebensmittel-Untersuch. Forsch.*, 1953, **97**, 7-11. [Inst. Chem., Univ. Ankara.]

An average loss of 73 per cent. of riboflavin, estimated fluorimetrically, occurred in the conversion of wheat into bulgur (see Abst. 414), the greater part during boiling with water, but an

appreciable amount was lost with the husks and other residues.—R. Marshall.

423

SHERWOOD, D. H., HILL, E. G. and SLOAN, H. J. L-Lyxoflavin in the starting diets of turkeys and chickens. *Proc. Soc. Exp. Biol. Med.*, 1953, **83**, 395-398. [Dept. Poultry Husb., Univ. Minnesota, St. Paul.]

Day-old turkey poult were given for 4 weeks a maize and soya bean ration with added choline, vitamin B₁₂ and penicillin. In male birds, supplements of L-lyxoflavin gave a highly significant growth response. In experiments with chicks on a purified ration L-lyxoflavin was without effect.

E. M. Cruickshank.

See also Absts. 167, 1355.

NICOTINIC ACID (NIACIN)

424

JOHNSON, B. C. and LIN, P. H. Nicotinic acid metabolism. 1. The use of paper chromatography in the study of nicotinic acid metabolism.

LIN, P. H. and JOHNSON, B. C. 2. The metabolism of radioactive nicotinic acid and nicotinamide in the rat. *J. Amer. Chem. Soc.*, 1953, **75**, 2971-2973; 2974-2977. [Div. Animal Nutrit., Univ. Illinois, Urbana.]

1. Nicotinic acid and its metabolites were separated on paper strip chromatograms with a solvent system of water-saturated *n*-butanol and acetone. The spots were detected by the CNBr reaction, by fluorescence, by spectral absorption with a Beckman spectrophotometer, and by bio-autographic and radio-autographic methods. The technique proved satisfactory for identifying excretion products of nicotinic acid in the urine of man and the rat, pig, guinea-pig, lamb and calf.

2. Nicotinic acid and nicotinamide labelled with ¹⁴C in the carboxyl group were given by intraperitoneal injection to 12 rats in glass metabolism cages. Urine and faeces were collected for 48 hr. and the animals were killed and the residual radioactivity in the carcass was measured. Very little radioactivity was found in the faeces; from 23 to 30 per cent. of the total injected remained in the carcass, and from 43 to 70 per cent. was in the urine. Of the radioactivity in the urine, 60 per cent. was present in nicotinuric acid after injection of nicotinic acid; a compound resembling N¹-methylnicotinamide accounted for 65 per cent. of the ¹⁴C excreted after nicotinamide. In the urine of rats given nicotinic acid at least 7 radio-active metabolites were present and at least 9 in the urine of rats given nicotinamide. A metabolite hitherto unidentified appeared after both nicotinic

acid and nicotinamide and followed N¹-methyl-2-pyridone-5-carboxylamide closely on the paper chromatogram.

¹⁴C was found in CO₂ expired by the animals, showing that decarboxylation of nicotinic acid and even more readily of nicotinamide occurred in the animal body.—A. M. Copping.

425

UKITA, T., MIZUNO, D. and KOSAKA, S. [Vitamin activity of several 3-carbamylpyridinium halides.] *J. Pharm. Soc. Japan*, 1953, **73**, 111-115. [Inst. Infect. Dis., Univ. Tokyo.] In Japanese: English summary.

426

JANES, R. G. Certain metabolic effects of niacin and Priscoline. *Amer. J. Physiol.*, 1953, **174**, 46-48. [Dept. Anat., Coll. Med., State Univ. Iowa, Iowa City.]

The effects were compared of nicotinic acid and of a vasodilator substance, Priscoline, on the liver glycogen and acetone excretion of adult rats. The animals were given daily injections of 7 ml. physiological salt solution alone or with 35 mg. nicotinic acid or 20 mg. Priscoline during 5 days without food. Urine was collected throughout the period and liver and muscle were analysed at the end of the experiment. Both nicotinic acid and Priscoline raised the excretion of acetone bodies. With nicotinic acid the glycogen content of the liver rose and with Priscoline it fell. There was no apparent correlation between urinary excretion of ketones, and fat in the liver or muscle, or liver glycogen. The amount of N in the urine was above normal in both groups. It seemed that although both substances increased excretion of ketones their metabolic effects were different.—A. M. Copping.

427

COSTABILE, L., SCALA, E., SCARDI, V. and VIRGILIO, A. Formazione dei piridin-nucleotidi da triptofano e da amide nicotinica nelle emazie umane *in vitro*. [Formation of pyridine nucleotides from tryptophan and from nicotinamide by human red cells *in vitro*.] *Boll. Soc. ital. Biol. sper.*, 1952, **28**, 1850-1852. [Ist. Chim., Fac. Med., Univ. Naples.]

The amount of pyridine nucleotides synthesised by washed human red cells incubated at 37° C. in Ringer phosphate solution was increased many times by addition of nicotinamide but not of tryptophan or vitamin B₆ or both.—E. M. Hume.

428

CASTRO BARAHONA, J. Acción de la nicotinamida sobre la glucemia normal del conejo. [Effect of nicotinamide on the normal blood sugar of the rabbit.] *An Fac. Farm. Bioquím., Lima*, 1951, **2**, 498-503. [Lab. Farmacol., Univ. Nac. Mayor de San Marcos, Lima.]

Injection of from 0.005 to 0.020 mg. nicotinamide per kg. bodyweight into 7 male and 5 female rabbits of about 2 kg. weight caused a fall in the blood sugar value. The decrease was most marked after from 2 to 3 hr., and was greater in males than in females. The effect disappeared within 6 hr.—A. M. Copping.

429

NELSON, T. S. and SCOTT, H. M. Niacin deficiency in the chick as influenced by antibiotics. *Poultry Sci.*, 1953, **32**, 601-604. [Illinois Agric. Exp. Stat., Urbana.]

In chicks given a purified basal diet containing only 0.48 mg. nicotinic acid per kg. with dextrin or sucrose as the carbohydrate, viability and growth were poor and were not influenced by supplements of aureomycin or penicillin. Growth was significantly improved by supplements of 15 mg. nicotinic acid per kg. diet, but the incidence of perosis was high, with and without antibiotics, and irrespective of the carbohydrate given. Growth was further stimulated by increasing the amount of nicotinic acid to 50 mg., and perosis was almost eliminated. With either amount of nicotinic acid, aureomycin or penicillin significantly increased the growth response, particularly when the diet contained sucrose.—E. M. Cruickshank.

430

PEPPER, W. F., SLINGER, S. J. and MOTZOK, I. Effect of aureomycin on the niacin and man-

ganese requirements of chicks. *Poultry Sci.*, 1953, **32**, 656-660. [Dept. Poultry Husb., Ontario Agric. Coll., Guelph.]

Groups of chicks received for 4 weeks diets containing all combinations of 10, 30 and 50 p.p.m. Mn and 9, 18 and 27 mg. nicotinic acid per lb., with or without 25 p.p.m. aureomycin. On all diets aureomycin increased growth and efficiency of feed utilisation but the response was relatively small on the diet containing 10 p.p.m. Mn and 9 mg. nicotinic acid. The results showed that aureomycin improved the utilisation of both Mn and nicotinic acid. When the diet contained 10 p.p.m. Mn combined with 9, 18 or 27 mg. nicotinic acid the incidence of perosis at 4 weeks of age was 60, 45 and 65 per cent., respectively. In the presence of aureomycin the corresponding figures were 35, 5 and 15. The weight of the small intestine and caeca increased significantly with increase in the Mn content of the diet. Aureomycin reduced the weight of the small intestine and slightly, but not significantly, increased the caecal weight. The requirement for nicotinic acid is considered to be more than 18 mg. per lb. feed and that for Mn more than 30 p.p.m.—E. M. Cruickshank.

431

SCOTT, M. L. Prevention of the enlarged hock disorder in turkeys with niacin and vitamin E. *Poultry Sci.*, 1953, **32**, 670-677. [Cornell Univ. Agric. Exp. Stat., Ithaca, N.Y.]

In turkey poultts receiving a diet containing from 2 to 4 per cent. cod liver oil, a high incidence of enlarged hocks occurs, which can be prevented by supplements of dried brewer's yeast. Since such poultts exhibit creatinuria and reduced muscle creatine, but do not respond to supplements of vitamin E alone, experiments were undertaken to ascertain what deficiencies were involved. The results showed that both nicotinic acid and vitamin E were necessary to prevent the enlarged hocks which develop on the basal diet of Scott (Abst. 1449, Vol. 22). Supplements per lb. of diet of at least 20 mg. nicotinic acid and 5 mg. α -tocopheryl acetate were required for complete prevention but, if the diet contained 1 per cent. of dried brewer's yeast or a suitable anti-oxidant, 2.5 mg. tocopherol were sufficient. It is suggested that brewer's yeast prevents the condition through its high content of available nicotinic acid and the presence in it of an anti-oxidant which protects vitamin E in the diet or in the body or both.

E. M. Cruickshank.

VITAMIN B₆ (PYRIDOXINE, ADERMIN)

432

NOVAK, A. F., GAMA, A. R., LINZZO, J. A. and RUBLOFF, E. B. **Factors affecting the microbiological assay of pyridoxine in multivite products.** *J. Amer. Pharm. Assoc.*, 1953, **42**, 581-583. [Res. Labs., Nutrilite Products, Inc., Buena Park, Calif.]

It was found necessary to supplement Difco Bacto Pyridoxine Assay Medium with vitamin B₁ when the pyridoxine content of crystalline multivitamin preparations was estimated with *Neurospora sitophila* A.T.C.C. 9276. Certain plant concentrates were found to contain another substance necessary for growth of the organism. It was distinct from vitamin B₁, folic acid, biotin, *p*-aminobenzoic acid, vitamin B₁₂, riboflavin, nicotinic acid and inositol.—K. H. Coward.

433

HEYL, D., LUZ, E., HARRIS, S. A. and FOLKERS, K. **Chemistry of vitamin B₆. 10. Some homologs of the vitamin B₆ group. 11. Homologs of 4-desoxy-pyridoxine.** *J. Amer. Chem. Soc.*, 1953, **75**, 4079-4080; 4080-4081. [Res. Labs., Merck and Co., Inc., Rahway, N.J.]

434

BEARE, J. L., BEATON, J. R. and MCHENRY, E. W. **Studies on vitamin B₆. 3. Carcass composition of the vitamin B₆-deficient rat.** *J. Biol. Chem.*, 1953, **202**, 589-595. [Dept. Pub. Health Nutrit., Univ. Toronto.]

When rats of average initial bodyweight 115 g. were given purified diets containing 20 per cent. of casein and 20 per cent. of maize oil, deprivation of vitamin B₆ and administration of deoxypyridoxine for 21 days produced typical skin lesions, and analysis of the carcasses showed a decrease of crude fatty acids with a slight increase in protein and water content, in comparison with pair-fed rats given vitamin B₆. Deprivation of vitamin B₁ in a similar experiment had an effect on body composition similar to lack of vitamin B₆. In a further experiment male rats of 240 g. and females of 181 g. were given diets without or with 5 or 20 per cent. of maize oil, with or without vitamin B₆. Again it appeared that animals deprived of vitamin B₆ were unable to increase the crude fatty acid content of the body with increasing intake of fat, and both male and female rats showed the same low content of fatty acids when deprived of vitamin B₆. With the inclusion of fat in the diet severe skin lesions did not occur in these older rats deprived of vitamin B₆.

A. M. Copping.

435

CALDWELL, E. F. and MCHENRY, E. W. **Studies on vitamin B₆ and transamination in rat liver.** *Arch. Biochem. Biophys.*, 1953, **45**, 97-104. [Dept. Pub. Health Nutrit., Univ. Toronto.]

The transamination of aspartic acid and of alanine to glutamic acid was studied in the livers of rats having diets containing 5, 20, 50 or 94 per cent. of casein, with or without vitamin B₆. The lowering effect of deprivation of vitamin B₆ on liver transaminases was more marked when the protein content of the diet was substantially greater or less than 20 per cent. When food intake was restricted the activity of the enzymes was increased if vitamin B₆ was given. In rats deprived of vitamin B₆ it was less, the decrease being most marked on the diet with only 5 per cent. casein. The transamination of alanine appeared to be more sensitive to changes in the diet than that of aspartic acid. In some experiments male and female rats were studied separately and males showed higher transaminase activity. In rats deprived of vitamin B₁ but having vitamin B₆, the severe inanition associated with vitamin B₁ deficiency caused a rise in the transaminase activity of the liver. The results are discussed in relation to others reported previously (Abst. 439, Vol. 24).

A. M. Copping.

436

CALDWELL, E. F. and MCHENRY, E. W. **Desoxy-pyridoxine and liver transamination in the rat.** *Arch. Biochem. Biophys.*, 1953, **45**, 466-467. [Dept. Pub. Health Nutrit., Sch. Hyg., Univ. Toronto.]

Albino rats received a diet containing 20 per cent. casein and no vitamin B₆. They were divided into 2 groups, one receiving 100 µg. deoxypyridoxine daily, and the other the basal diet only but with intake restricted to that of the first group. After 4 weeks the rats of the first group had severe dermatitis typical of vitamin B₆ deficiency and a much lower bodyweight. The rats were then fasted for 45 hr. and killed, and the transaminase activity of the liver was estimated. There was no significant effect on the aspartic-glutamic acid reaction but there was a great increase in the rate of alanine-glutamic acid transamination in the rats with dermatitis.

It is suggested that the presence of dermatitis was not related to alterations in the amount of transaminases.—V. R. Jackson.

437

LENTI, C. and GRILLO, M. A. **Attivazione con piridoxalfosfato, glutatione, adenosin-5-fosfato e adenosina del processo di formazione di**

acetaldeide dalla d, l-treonina nel fegato. [Activation by pyridoxal phosphate, glutathione, adenosine-5-phosphate and adenosine of the formation of acetaldehyde from dl-threonine in the liver.] *Boll. Soc. ital. Biol. sper.*, 1952, **28**, 1970-1973. [Ist. Chim. Biol., Univ. Turin.]

The formation of acetaldehyde from dl-threonine by extract of fresh rat liver or of acetone liver powder was considerably increased in presence of pyridoxal phosphate. The reaction was inhibited in presence of hydroxylamine, but the inhibition was counteracted by excess of pyridoxal phosphate. In the formation of acetaldehyde from threonine by glutathione and to some extent, by extract of fresh liver but not of acetone powder, pyridoxal phosphate could be replaced by adenosine-5-phosphate or adenosine, but not by adenosinedi- or -triphosphate, adenine or ribose.—E. M. Hume.

438

THOMPSON, R. Q. and GUERRANT, N. B. Effect of dietary protein and vitamin B₆ on hepatic thionase activity. *J. Nutrition*, 1953, **50**, 161-174. [Dept. Agric. Biol. Chem., Pennsylvania State Coll., State College.]

Weanling albino, black and piebald rats were given purified diets containing 20 or 40 per cent. casein with or without vitamin B₆ in the vitamin supplements. A third group received the diet with 20 per cent. casein and added DL-methionine and L-cystine. Animals in each group were killed at the beginning of the experiment and after 3, 7, 14, 21, 28 and 35 days, and the cysteine desulphydrase (thionase) activity of the livers was measured in a Warburg apparatus. Thionase activity in rats on stock diet was at a maximum during the first 3 weeks after weaning. In rats having synthetic diets with added vitamin B₆ there was at first a decrease of thionase and then a progressive increase. In rats deprived of vitamin B₆ there was a marked decrease even after 3 days, and after 21 days the thionase activity was negligible. When the diet contained 40 per cent. of casein or extra methionine and cystine, the decrease was more rapid, and the animals showed signs of vitamin B₆ deficiency earlier than those having 20 per cent. of casein. If after 21 days' deprivation vitamin B₆ was given there was rapid restoration of thionase activity in the liver. It could be restored also *in vitro* by addition of pyridoxal phosphate to extracts of liver from deprived rats.

A. M. Copping.

439

CALDWELL, E. F. and McHENRY, E. W. Vitamin B₆ and urea formation. *Arch. Biochem. Biophys.*, 1953, **44**, 396-403. [Dept. Pub. Health Nutrit., Univ. Toronto.]

Urea formation was studied in tissue slices from livers of rats which had received for 6 weeks a

purified diet containing 20 per cent. of casein with or without pyridoxine. One group given pyridoxine had their food intake restricted to that of the group without pyridoxine. Deprivation of vitamin B₆ caused an increase in blood urea, and the livers from rats with high blood urea showed increased formation of urea *in vitro*. If the simple incubation medium with lactate and ammonia was supplemented with ornithine the increased urea formation in livers from rats deprived of vitamin B₆ was still greater.

In a further experiment a diet containing 5 per cent. casein was given for 25 days followed by the diet with 20 per cent. casein. The period of low-protein intake increased the effect of deprivation of vitamin B₆ on urea formation. Injection of alanine on the basis of 0.5 mg. alanine N per g. bodyweight depressed urea formation in liver slices within 12 hr., and caused the values for livers from rats with and without vitamin B₆ to be within nearly the same range.—A. M. Copping.

440

McFARLAND, W. Effect of high pyridoxine intake in cholesterol-fed chicks. *Arch. Pathol.*, 1953, **55**, 503-505. [Dept. Biochem., Pennsylvania State Coll., State College.]

In an experiment with 24 cockerels 5 weeks of age, a mash diet was supplemented with 1 per cent. of cholesterol, alone or with 16 or 80 mg. pyridoxine per lb. diet. The presence of pyridoxine did not reduce the blood cholesterol and when the birds were killed after 5 months the atherosclerotic lesions were more severe in those which had had pyridoxine than in those without.

A. M. Copping.

441

RIGGS, T. R., COYNE, B. and CHRISTENSEN, H. N. Intensification of the cellular accumulation of amino acids by pyridoxal. *Biochim. biophys. Acta*, 1953, **11**, 303-304. [Dept. Biochem., Tufts Coll. Med. Sch., Boston, Mass.]

With cells of Ehrlich mouse-ascites carcinoma in Krebs Ringer bicarbonate solution, pyridoxal in appropriate concentration increased the amount of glycine accumulated from the medium by the cells by from 65 to 75 per cent. The effect appeared to depend on a definite concentration of pyridoxal in the extracellular fluid, since incubation of the cells in ascitic fluid with pyridoxal did not prevent subsequent stimulation when the ascitic fluid was replaced by pyridoxal in Krebs Ringer solution.

Pyridoxal phosphate was less effective than pyridoxal. No effect was given by pyridoxamine, pyridoxine, riboflavin, vitamin B₁, nicotinic or pantothenic acid.

The concentration by the cells of L- α -diaminobutyric acid also was stimulated by pyridoxal.

V. R. Jackson.

N.A. and R., January 1954

PANTOTHENIC ACID

442

SZALKOWSKI, C. R. and DAVIDSON, J. H. (Jr.) **Colorimetric determination of calcium pantothenate.** *Anal. Chem.*, 1953, **25**, 1192-1195. [Control Div., Merck and Co., Inc., Rahway, N.J.]

In vitamin mixtures, purification by chromatography on a Florisil tower, followed by treatment with cupric sulphate and calcium hydroxide, yielded a product in which calcium pantothenate could be estimated without interference. It was hydrolysed in acid, yielding $\alpha\gamma$ -dihydroxy- $\beta\beta$ -dimethylbutyric acid, which reacted with 2:7-naphthalenediol in sulphuric acid solution to give a coloured product with absorption at 465 m μ . from which it could be estimated.—R. Marshall.

443

LÉVY, G. and GIROUD, A. Dosage de l'acide pantothénique du foie d'embryon de rate. [Estimation of pantothenic acid in the liver of the embryo rat.] *Bull. Soc. Chim. biol.*, 1953, **35**, 507-510.

Livers were rapidly removed from the embryos of rats killed on the 21st day of gestation, and were frozen at -20°C . for immediate analysis or were lyophilised and stored until it was convenient to use them. The two methods gave almost identical results. Pantothenic acid was estimated microbiologically after liberation from the tissues by autolysis. The values found for the livers of all the embryos in a litter were similar and, for the 5 litters studied, little difference was found, the average values ranging from 22.1 to 34.4, with a mean of 27.5, m μg . per g. fresh liver.

A. M. Copping.

444

NOVELLI, G. D. **Studies concerning the structure of coenzyme A.** *J. Cell. Comp. Physiol.*, 1953, **41**, Suppl. 1, 67-87. [Biochem. Res. Lab., Massachusetts Gen. Hosp., Boston.]

Work is described to determine the structure of co-enzyme A, and it is suggested that it consists of 1 mole each of pantothenate, adenine, ribose and β -mercaptoethylamine, and 3 of phosphate. In the suggested structure pantothenate is connected to adenosine through a pyrophosphate bridge and to β -mercaptoethylamine through the carboxyl group of the β -alanine portion of pantothenate. Reservations are made concerning the exact positions of the free phosphate group on the adenosine moiety, and of the attachment of the pyrophosphate bridge to pantothenic acid.

V. R. Jackson.

445

KLEIN, H. P. and LIPMANN, F. **The relationship of coenzyme A to lipide synthesis. 1. Experiments with yeast. 2. Experiments with rat liver.** *J. Biol. Chem.*, 1953, **203**, 95-99; 101-108. [Biochem. Res. Lab., Massachusetts Gen. Hosp., Boston.]

1. A strain of *Saccharomyces cerevisiae*, deprived of co-enzyme A by washing, was grown in the pantothenic-acid-deficient basal medium of Sarett and Cheldelin (Abst. 1370, Vol. 15) with vigorous aeration, or occasionally with small amounts of pantothenic acid. Normal co-enzyme A content was restored by the method of Novelli and Lipmann (*J. Biol. Chem.*, 1950, **182**, 213). Total lipids and steroids were estimated before and after incubation.

With increasing concentration of pantothenic acid in the medium, cell yield and sterol content per unit weight were functions of the initial concentration. There was also a parallel between the content of steroid (ergosterol) and of cellular co-enzyme A. Comparisons in aerobic conditions of lipid synthesis by resting yeasts poor or rich in co-enzyme A showed a close relationship between co-enzyme A content and the ability to synthesise lipids.

Low co-enzyme A content of yeast could be increased in anaerobic conditions by pantothenic acid in the presence of a high content of glucose. There was no increase in lipids, but when labelled acetate was supplied there were significant differences between cells poor and rich in co-enzyme A in their ability to incorporate acetate into fatty acids and steroids.

2. Male weanling albino rats received a basal diet with or without pantothenic acid. After from 4 to 6 weeks, the deprived animals showed signs of deficiency. The rats were then killed and liver slices were prepared and incubated with radioactive acetate in Ringer solution. Measurement was made of co-enzyme A and of labelled acetate in cholesterol and fatty acids. The respiration rate was estimated manometrically.

Livers deficient in co-enzyme A synthesised relatively little lipid. Livers occasionally retained large amounts of co-enzyme A and functioned almost normally although the rats showed typical outward signs of pantothenic acid deficiency. Values for fatty acids and cholesterol were low in the livers of animals lacking co-enzyme A. The content of co-enzyme A had little effect on respiratory rate. In the presence of pantooyltauryl-*p*-anisidide the synthesis of steroid and fatty acids by livers with a low content of co-enzyme A was

depressed; this effect was partially reversed by pantethine but not by pantothenic acid or coenzyme A.—V. R. Jackson.

chromic; in non-deficient hypertensive dogs the anaemia was microcytic and hypochromic.

E. M. Hume.

446

ERSHOFF, B. H., SLATER, R. B. A. and GAINES, J. G. **Effects of pantothenic acid deficiency on pituitary-adrenal function in the rat.** *J. Nutrition*, 1953, **50**, 299-316. [Emory W. Thurston Labs., Los Angeles, Calif.]

Two groups of weanling rats were given a purified diet with or without pantothenic acid and a third group received the diet with pantothenic acid but in amounts restricted to the intake of the deprived rats. After 30 days, when some of the deprived rats had died and weight was stationary in all, blood counts were made on blood obtained from the tail immediately and 2, 4 and 24 hr. after injection of adrenaline or adrenocorticotrophic hormone. The lymphopenic response to the hormones was not impaired by lack of pantothenic acid. Measurement of ascorbic acid and of cholesterol in the adrenal glands of rats with and without pantothenic acid and treated with adrenaline or adrenocorticotrophic hormone showed no significant difference attributable to the deficiency. Intact rats deprived of pantothenic acid survived after injection of egg white which was highly lethal to adrenalectomised, non-deprived rats. It is concluded that no significant impairment of pituitary or adrenal function was associated with pantothenic acid deficiency.—A. M. Copping.

447

RALLI, E. P., DUMM, M. E. and GERSHBERG, H. **Effects of injury and dietary factors on adrenal weight and cholesterol concentration.** *J. Clin. Endocrinol.*, 1953, **13**, 874. *Proc. [Coll. Med., Univ. New York.]*

448

LEWIS, L. A. and PAGE, I. H. **Pantothenic acid deficiency in experimental renal hypertension in dogs.** *Amer. J. Physiol.*, 1953, **173**, 359-363. [Res. Div., Cleveland Clin. Found., Ohio.]

In adult dogs high blood pressure was produced by wrapping the kidneys in silk (Page, *Science*, 1939, **89**, 273), and pantothenic acid deficiency was caused by the diet of Street (*J. Biol. Chem.*, 1935, **109**, 657), modified. Blood pressure remained high for the first 3 weeks, and then fell considerably for the next 3 or 4 weeks and, unless pantothenic acid was given, the dogs died. When pantothenic acid was given they recovered and the blood pressure gradually rose to be as high as or higher than before. During the deficiency Hb fell and many red cells were macrocytic and hypo-

449

VITALE, J. J., HEGSTED, D. M., DIGIORGIO, J. and ZAMCHECK, N. **Interrelations between pantothenic acid, protein and calorie intakes with respect to respiration and morphology of duodenal mucosa.** *Metabolism*, 1953, **2**, 367-374. [Dept. Nutrit., Harvard Sch. Pub. Health, Boston, Mass.]

Weanling albino rats received a purified basal diet with 18 per cent. casein or one with the casein raised to 60 per cent. at the expense of sucrose. B vitamins were added to each of the diets to provide, in mg. per 100 g. diet, nicotinic acid 4, riboflavin 0.8, pyridoxine HCl 0.4, vitamin B₁ 0.4, calcium pantothenate 2, or 5 times those amounts. Pantothenic acid deficiency was produced by omitting pantothenic acid from the diet, but to maintain a chronic deficiency for 90 days the basal diet with 2 mg. pantothenic acid per 100 g. was given on one day weekly. Some rats receiving the non-deficient diets were fed to appetite or restricted to 10 g. a day. When the rats were killed the respiratory rate of the duodenal mucosa was estimated manometrically.

Restricted intake of the non-deficient basal diet with 18 per cent. protein, but not of that with 60 per cent., reduced the O₂ consumption (QO₂) of the duodenal mucosa. In pantothenic-acid-deficient animals fed to appetite neither high protein nor high vitamin intake sufficed to maintain the normal QO₂. Bleeding into the small intestine occurred in all the pantothenic-acid-deficient rats, and the fall in the QO₂ occurred soon after occult blood was detected in the faeces.

The specific effect of pantothenic acid deficiency on the QO₂ could be shown only when the protein intake was normal or high, and the use of paired feeding and food restriction in such experiments is criticised.—V. R. Jackson.

450

LUECKE, R. W., HOEFER, J. A. and THORP, F. (Jr.) **The supplementary effects of calcium pantothenate and aureomycin in a low protein ration for weaning pigs.** *J. Animal Sci.*, 1953, **12**, 605-610. [Dept. Agric. Chem., Michigan Agric. Exp. Stat., East Lansing.]

Six groups of 10 weanling pigs were given a maize and soya bean meal diet alone or with a supplement of 5 mg. aureomycin, or 2 or 4 mg. Ca pantothenate per lb. diet, or combinations of aureomycin and pantothenate. Significant improvement in weight gain and feed utilisation was observed in all groups receiving pantothenate, and a supplement of 2 mg. appeared to be as satisfactory

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as one of 4 mg. With aureomycin alone, weight gain was slightly superior to that on the basal diet, but half the pigs showed signs of pantothenic acid deficiency although the diet contained 4.15 mg. pantothenate per lb.; the addition of a further 2 mg. pantothenate protected. The problems of the requirement for pantothenate and of the physiological availability of pantothenate in the diet are discussed.—A. M. Copping.

451

FIDANZA, A., GIUNCHI, G., RUTIGLIANO, M. L., SCURO, L. A. and SORICE, F. Influenza di vari antibiotici sull'acrescimento di giovani ratti alimentati con dieta sintetica, priva di acido pantotenico. [Effect of various antibiotics on the growth of young rats fed on a

synthetic diet without pantothenic acid.] *Boll. Soc. ital. Biol. sper.*, 1953, **29**, 69–71. [Ist. Fisiol., Univ. Rome.]

It was previously observed that chloramphenicol influenced favourably the growth of young rats deprived of pantothenic acid (Abst. 4299, Vol. 23). Six groups of from 7 to 9 young rats weighing from 30 to 60 g. were given a basal diet complete except for pantothenic acid, alone, or with aureomycin, penicillin, chloramphenicol, streptomycin or pantothenic acid. All the antibiotics raised the growth performance above that of the group having no addition. Aureomycin was the most effective, growth being about three-quarters of that with pantothenic acid; with the other three antibiotics growth was about half.

E. M. Hume.

BIOTIN

452

TERROINE, T. Action de bleu de méthylène sur la vitesse d'apparition des symptômes caractéristiques de la carence en biotine. [Effect of methylene blue on the speed of appearance of the signs characteristic of biotin deficiency.] *C.R. Acad. Sci.*, 1953, **236**, 2265–2267.

Three groups of rats received a diet deficient in biotin, or the same with 5 times the amounts of vitamins B₁, B₆ and riboflavin adequate to prevent the signs of secondary deficiencies from appearing, or the same deficient diet with methylene blue.

There was no difference between the groups in appetite. Methylene blue and, to a less extent, the extra B vitamins delayed the development of signs which included alopecia, oedema and abnormal gait, but did not retard loss of weight. Methylene blue also prolonged survival time.

V. R. Jackson.

453

AXELROD, A. E. and HOFMANN, K. The failure of biotin or oxybiotin to exert a "procarcinogenic" effect on tumor formation by 4-dimethylaminoazobenzene. *Cancer Res.*, 1953, **13**, 442–444. [Inst. Pathol., W. Pennsylvania Hosp., Pittsburgh.]

Groups of 20 male weanling albino rats received a purified basal diet containing dimethylaminoazobenzene, alone or supplemented with 40 µg. *d*-biotin or 800 µg. *dl*-oxybiotin per 100 g. At death or after 8 or 12 months, the liver was removed for histological examination, and biotin and oxybiotin were estimated in both the liver and the tumour.

After 8 months, no hepatic tumour was present in any group and the degree of histopathological change was the same. After 12 months, those

receiving basal diet only showed signs of mild biotin deficiency and the biotin content of the liver was reduced. The number of animals surviving in the respective groups was 17, 17 and 15, with 2 in each group showing tumours. All those that died earlier had tumours. The incidence of tumour, either hepatoma or adenocarcinoma, and the degree of histopathological change, was the same in all the groups. The biotin content of the tumours was significantly less than of liver tissue, which remained normal. It is concluded that there is no evidence that biotin or oxybiotin promotes the carcinogenic effect of a diet containing 4-dimethylaminoazobenzene.—V. R. Jackson.

454

DI MARCO, A., ZANCHI, B. and ZAVAGLIO, V. Inibizione della crescita di M.TBC. da antagonisti di biotina. [Inhibition of growth of *Mycobacterium tuberculosis* by antagonists of biotin.] *Sperimentale*, 1952, **102**, 339–346. [Lab. Ric. Farmitalia, Milan.]

For *Mycobacterium tuberculosis*, *in vitro*, biotin in increasing concentration overcame the inhibitory effect in increasing concentration of the hydrazide of (4-imidazolidone-2)-caproic acid, which is structurally related to biotin.—E. M. Hume.

455

EVANS, R. J., DAVIDSON, J. A., BAUER, D. and BUTTS, H. A. The biotin content of fresh and stored shell eggs. *Poultry Sci.*, 1953, **32**, 680–683. [Dept. Agric. Chem., Michigan State Coll., East Lansing.]

Eggs from White Leghorn hens maintained on a ration of constant composition were tested for biotin after storage at 0° C. for 3, 7 or 12 months. The eggs were boiled for 30 min. before being

tested by the procedure of Wright and Skeggs (Abst. 2261, Vol. 14) with *Lactobacillus arabinosus* as test organism. Fresh shell eggs contained on an average 225 $\mu\text{g.}$ per g. or 10.76 $\mu\text{g.}$ per egg of which 2.25 $\mu\text{g.}$ was in the white and 8.52 $\mu\text{g.}$

in the yolk. The concentration in the white and yolk was 70 and 520 $\mu\text{g.}$ per g., respectively. No loss of biotin occurred in storage and there was no transfer of the vitamin between white and yolk.

E. M. Cruickshank.

p-AMINOBENZOIC ACID

456

SIRKS, J. L. **Derivatives of *p*-aminobenzoic acid and their action on the growth of bacteria.**

Non-competitive antagonists for derivatives of *p*-aminobenzoic acid. *Antonie van Leeuwenhoek J. Microbiol. Serol.*, 1953, **19**, 166-170; 171-180. [Bacteriol. Serol. Lab., Univ. Groningen.]

Derivatives of *p*-aminobenzoic acid obtained by substitution in the benzene ring were tested for their effect on the growth of *Aerobacter aerogenes* in synthetic medium and of *Diplococcus pneumoniae* in ascites broth without peptone. Growth was inhibited by the 2-amino-, 3-amino-, 3-dimethyl-, 3-hydroxy-, 2-chloro- and 2-bromo-derivatives, by the last 3 only in high concentrations. The 2-hydroxy-, 2-fluoro- and 2-nitro-derivatives caused slight growth stimulation. Other derivatives tested, including nitro- and acetamino-compounds, were inactive.

Further study of some of the derivatives which inhibited growth was made with *Bacterium coli* and showed that the inhibition could be overcome by *p*-aminobenzoic acid and by a number of other substances such as methionine, xanthine, serine, thymine and valine. The effect of these non-competitive antagonists varied for the various

derivatives, and a hypothesis is put forward to explain the results with the suggestion that the derivatives do not compete directly with *p*-aminobenzoic acid for an essential enzyme, but that they are used by the bacterium to form pteroylglutamic acid derivatives which may in turn compete for the enzyme.—A. M. Copping.

457

YAMAMOTO, T. and SUZUKI, K. **Effect of *p*-aminobenzoic acid and some antibiotics on rickettsial toxicity for mice.** *Jap. J. Exp. Med.*, 1952, **22**, 325-331. [Inst. Infect. Dis., Univ. Tokyo.]

The inhibitory effect of *p*-aminobenzoic acid, penicillin, chloramphenicol and aureomycin on the toxin of *Rickettsia mooseri* was tested by mixing them in different concentrations with toxin before it was injected into mice. If the mixtures were injected immediately, toxicity was not lessened, but if they were kept for 2 hr. or longer at 35° C. it was considerably decreased. Aureomycin was the most effective inhibitor and *p*-aminobenzoic acid the least. The results are discussed with reference to other reports of the effects of *p*-aminobenzoic acid and antibiotics in experimental and clinical rickettsial infections.—A. M. Copping.

FOLIC ACID (PTEROYLGLUTAMIC ACID)

458

AVALOS BUSTAMANTE, B. **Estudio químico funcional y valoración fotocolorimétrica del ácido pteroilglutámico (fólico) en especialidades farmacéuticas. [Chemical properties and photocolorimetric estimation of pteroylglutamic (folic) acid in pharmaceutical preparations.]** *An. Fac. Farm. Bioquim., Lima*, 1951, **2**, 696-706. [Lab. Bioquim. Espec., Univ. Nac. Mayor de San Marcos, Lima.]

A colorimetric method was elaborated for estimating folic acid in acid medium by liberation of the *p*-aminobenzoic fraction and diazotisation of this substance. The method was found highly accurate for amounts of 0.25 to 5.0 mg. folic acid. In a number of preparations containing folic acid the amounts found ranged from 80 to 98.5 per cent. of the amounts stated to be present.

A. M. Copping.

459

OCHIAI, E. and ENDO, H. **[Synthesis of an isomer of pteroylglutamic acid.]** *J. Pharm. Soc. Japan*, 1953, **73**, 763-766. [Pharm. Inst., Med. Fac., Univ. Tokyo.] In Japanese: English summary.

The substitution of anthranilic acid for the *p*-aminobenzoic portion of folic acid gave a compound which, in biological tests, showed neither antagonistic nor synergistic action for folic acid.

K. H. Coward.

460

ANDREWS, M. M. and SCHWEIGERT, B. S. **Studies on the measurement of the folic acid and citrovorum factor potencies of certain natural products.** *Arch. Biochem. Biochys.*, 1953, **44**, 165-175. [Div. Biochem. Nutrit., Amer. Meat Inst. Found., Chicago, Ill.]

N.A. and R., January 1954

Folic acid was estimated with *Lactobacillus casei* and *Streptococcus faecalis* R, and citrovorum factor with *Leuconostoc citrovorum*, in yeast extract and beef liver, kidney, rib muscle, spleen and heart. The problem of the enzymic treatment in preparing samples was investigated; addition of cysteine increased the total folic acid measured in liver but not in other tissues or in yeast. The most effective method of liberating folic acid and citrovorum factor from bound forms varied with the tissue examined. Studies were made also of the stability of the two factors to heat treatment at pH 4 and pH 7 and in the presence of enzymes. Autoclaving at pH 7 for 5 min. in presence of cysteine gave fairly satisfactory results, and showed that for most tissues the greater portion of the total folic acid activity was due to folic acid and not to citrovorum factor, but for spleen and heart about 70 per cent. of the potency might be in the form of citrovorum factor.—A. M. Copping.

461

BOND, T. J. **Production of folinic acid from folic acid by *Lactobacillus casei*.** *Science*, 1953, **117**, 563-564. [Dept. Chem., Baylor Univ., Waco, Tex.]

When *Lactobacillus casei* was grown in a synthetic medium containing purines and folic acid, folinic acid was synthesised in amounts which increased with increasing concentration of folic acid. The folinic acid was measured with cultures of *Leuconostoc citrovorum*, which tended to become acid in spite of the presence of phosphate buffer so that some of the folinic acid may have been destroyed by acid hydrolysis before it could be estimated.

A. M. Copping.

462

NICHOL, C. A. **On the metabolic alteration of pteroylglutamic acid.** *Proc. Soc. Exp. Biol. Med.*, 1953, **83**, 167-170. [Dept. Pharmacol., Sch. Med., W. Reserve Univ., Cleveland, Ohio.]

Weanling albino rats and Rhode Island chicks were depleted of folic acid by diets containing succinylsulphathiazole. Preparations, involving autolysis for 18 hr. to produce citrovorum factor, were made from the tissues and incubated with *Leuconostoc citrovorum* for 18 hr. with or without pteroylglutamic acid. Growth was estimated turbidimetrically.

A small amount of citrovorum factor was formed by all tissues except blood but conversion of pteroylglutamic acid occurred mainly in the liver. The amount of citrovorum factor in bone marrow was small but the relative increase of it in the presence of pteroylglutamic acid was greater than in the other tissues except liver. In livers of rats depleted of folic acid, the amount of citrovorum factor increased within 1 hr. of an intra-

peritoneal injection of pteroylglutamic acid and fell after 24 hr. to that of normal animals.

Slices of liver from depleted rats or chicks were incubated under N₂ or O₂, and the yields of citrovorum factor were considerably higher in the anaerobic conditions. Addition of Na ascorbate increased the yield.—V. R. Jackson.

463

WOODS, D. D. **Folic acid and related compounds in the metabolism of micro-organisms.** *Brit. Med. Bull.*, 1953, **9**, 122-125. [Microbiol. Unit, Dept. Biochem., Univ. Oxford.]

464

RAUEN, H. M. and JAENICKE, L. Über "aktivierete Ameisensäure" und die fermentative Transformylierung. ["Activated formic acid" and enzymic formylation.] *Hoppe-Seyler's Ztschr.*, 1953, **293**, 46-47. [Physiol. Chem. Inst., Univ. Marburg a.d. Lahn.]

A preliminary report is given on studies of enzymic transfer of formyl groups in the synthesis and breakdown of formylfolic acid in liver homogenates from the sheep, pig, cow and calf. The integrity of the respiratory cycle of the tissue appeared to be essential, and adenosinetriphosphate catalysed the enzymic formylation. The most effective formyl donors were serine and histidine. With the demonstration of enzymic removal of the formyl group a theory of a trans-formylation cycle is suggested to include the so-called activated formic acid.—A. M. Copping.

465

TOTTER, J. R. **The biological functions of pteridine derivatives.** *J. Cell. Comp. Physiol.*, 1953, **41**, Suppl. 1, 241-259. [Univ. Arkansas Sch. Med., Little Rock.]

Work on the biological functions of pteridines is summarised and discussed, particularly the theory that pteroylglutamic acid or its co-enzyme acts as a transformylase. It is considered that undue emphasis has been placed in the past on the trans-formylating activity of pteridines and that other important functions have been overlooked. An alternative mechanism is suggested to explain failure of purine synthesis in folic acid deficiency and secondary related vitamin deficiencies. It is suggested that many signs of folic acid deficiency may be attributable to deficiencies of co-enzymes, especially co-enzyme A, caused by low tissue concentrations of adenylic acid.—V. R. Jackson.

466

SAUBERLICH, H. E. **Studies on the reversal of aminopterin toxicity in the rat with citrovorum factor, folacin and related compounds.** *J. Nutrition*, 1953, **50**, 101-115. [Dept.

Animal Husb., Alabama Agric. Exp. Stat., Auburn.]

Young rats receiving a purified diet containing 20 per cent. of casein with all vitamins of the B complex were given additional supplements of aminopterin, folic acid, synthetic citrovorum factor, penicillin, aureomycin, vitamin B₁₂, ascorbic acid and cortisone in various combinations. Aminopterin in an amount of 0.75 to 1.0 mg. per kg. in the diet was highly toxic but daily injection of 25 µg. citrovorum factor partly overcame the toxicity and inclusion of 100 µg. did so entirely. Injection of folic acid was ineffective but in the diet 100 mg. per kg. protected the rats. Citrovorum factor was effective by mouth as well as by injection and full protection was given by from 5 to 10 mg. per kg. diet. Injections of cortisone or ascorbic acid with or without folic acid gave no protection, but cortisone enhanced the effect of small injections of citrovorum factor. Antibiotics had no effect on the toxicity of aminopterin.

Studies were made of the enzyme systems in livers of rats given aminopterin, and disturbances of transmethylation were found with low methionine formation. The effect was overcome by adequate doses of citrovorum factor or folic acid.

The ascorbic acid content of the liver and adrenal glands was low in rats given aminopterin.

In one test increase in the protein content of the diet to 50 per cent. appeared to increase the toxic effect of aminopterin.—A. M. Copping.

467

GOLDIN, A., MANTEL, N., VENDITTI, J. M. and GREENHOUSE, S. W. **An analysis of dose-response for animals treated with aminopterin and citrovorum factor.** *J. Nat. Cancer Inst.*, 1953, **13**, 1463-1471. [Clin. Res. Unit, Nat. Cancer Inst., U.S. Pub. Health Serv. Hosp.]

In previous studies with mice, a linear relationship was observed between the doses of aminopterin and that of concomitantly administered citrovorum factor which together were predicted to kill 50 per cent. of the mice. As a result, an experiment was carried out with citrovorum factor and aminopterin given at different levels to 320 mice. The experiment was to test the hypothesis that these substances were competitively antagonistic.

The methods of this experiment are described in detail. The results are given, using probit analysis methods, along with similarly treated data from another series of experiments. Two tables and an appendix give the details of the method and 2 text figures illustrate the results obtained. Finally the results confirming the hypothesis are discussed with reference to "inhibition analysis" in the mammalian organism.

A. W. Boyne.

468

NICHOL, C. A., ZAKRZEWSKI, S. F. and WELCH, A. D. **Resistance to folic acid analogue in a strain of *Streptococcus faecalis*.** *Proc. Soc. Exp. Biol. Med.*, 1953, **83**, 272-277. [Dept. Pharmacol., Sch. Med., W. Reserve Univ., Cleveland, Ohio.]

The response of resistant and non-resistant strains of *Streptococcus faecalis* to aminopterin, amethopterin and other antagonistic analogues of folic acid was examined by a bio-autographic technique on paper strip chromatograms. Certain analogues supported growth in the resistant strain, and the method showed that they contained sufficient pteroylglutamic acid or pterioic acid to account for such an effect. The resistant strain appeared to have a low requirement for folic acid and a high capacity for converting folic acid into citrovorum factor, so that its growth was inhibited only by very high concentrations of antagonistic analogues.—A. M. Copping.

469

PHILLIPS, W. E. J., MAW, W. A. and COMMON, R. H. **Some effects of a folic acid antagonist on the responses of the immature pullet to treatment with gonadal hormones.** *Canad. J. Zool.*, 1953, **31**, 342-350. [Fac. Agric., McGill Univ., Macdonald Coll., Que.]

Pullets about 10 weeks old received a stock diet low in folic acid for a week and were then divided into 6 groups receiving no supplement or receiving oestradiol and testosterone on 5 alternate days, with or without aminopterin, or with feed intake restricted to that of birds receiving aminopterin. The birds were killed 2 days after the last hormone injection.

Hypertrophy of the oviduct caused by hormones was progressively decreased by aminopterin up to 0.5 mg. daily. There was no significant effect on liver pentose or deoxypentose nucleic acids. The hormones increased, and aminopterin did not affect, liver phosphoprotein or serum Ca. Folic acid, but not Na deoxyribonucleic acid, antagonised the effect of aminopterin in depressing oviduct response, and folic acid with aminopterin significantly decreased serum Ca. Deoxyribonucleic acid appeared to counteract the depressant effect of aminopterin on the weight of the spleen and adrenal glands.—V. R. Jackson.

470

FOUNTAIN, J. R., HUTCHISON, D. J., WARING, G. B. and BURCHENAL, J. H. **Persistence of amethopterin in normal mouse tissues.** *Proc. Soc. Exp. Biol. Med.*, 1953, **83**, 369-373. [Div. Exp. Chemotherap., Sloan-Kettering Inst., New York.]

VITAMIN B₁₂

471

JOHANSSON, K. R. **Response to and assay of vitamin B₁₂ by a mutant of *Escherichia coli*.** *Proc. Soc. Exp. Biol. Med.*, 1953, **83**, 448-453. [Dept. Bacteriol., Univ. Minnesota, Minneapolis.]

The mutant strain, *Bacterium coli* 113-3, was used to estimate vitamin B₁₂ with turbidity as criterion of response. The response varied with degree of aeration, growth being suppressed in anaerobic cultures. The organism responded to vitamin B₁₂ and to methionine in a medium containing mineral salts, citrate and glucose. Vitamin B_{12a} showed about 70 per cent. of the activity of vitamin B₁₂ in the test. When cyanide was present in the medium, vitamin B_{12a} was apparently converted into a substance with activity equivalent to vitamin B₁₂. Cyanide, or ascorbic acid or sodium thioglycollate in high concentrations, apparently destroyed the growth-stimulating property of vitamins B₁₂ and B_{12a}. In lower concentrations, cyanide and thioglycollate had some effect in protecting the vitamins against heat. Use of *Bact. coli* 113-3 is claimed to offer a simpler procedure for estimating vitamin B₁₂ than use of *Lactobacillus* species.—A. M. Copping.

472

TAUB, A. and LIEBERMAN, H. **Stability of vitamin B₁₂—folic acid parenteral solutions.** *J. Amer. Pharm. Assoc.*, 1953, **42**, 183-186. [Coll. Pharm., Columbia Univ., New York.]

Solutions suitable for injections could be prepared at a concentration of 30 µg. vitamin B₁₂ and 5 mg. folic acid per ml. at a pH of 6 and up to 6.5 in the presence of 10 per cent. nicotinamide. They were sufficiently stable, in respect of clarity of solution and potency of folic acid and vitamin B₁₂, to be useful in practice.—K. H. Coward.

473

BAXTER, N., HORSFORD, J., WOKES, F., NORRIS, F. W. and FERNANDES, S. J. G. **Cyanocobalamin and hydroxocobalamin in vitamin B₁₂ injections.** *J. Pharm.*, 1953, **5**, 723-736. [Ovaltine Res. Labs., King's Langley, Herts.]

A study of 66 different batches from several sources of vitamin B₁₂ for injection showed that they contained considerable proportions of hydroxocobalamin, sometimes involving as much as half of the cobalamin present. A spectrophotometric method of estimating cyanocobalamin in the presence of varying amounts of hydroxocobalamin was developed and checked by microbiological estimations on 11 samples of vitamin B₁₂ solutions before and after destruction of hydroxocobalamin

with ascorbic acid. Most of the 66 batches had a cyanocobalamin content between 90 and 110 per cent. of that claimed. In those with a content below the claim, the deficit was probably due to conversion of cyanocobalamin to hydroxocobalamin under the action of light; reconversion to cyanocobalamin could be effected by storage in the dark.—K. H. Coward.

474

ERICSON, L. E. **Note on vitamin B_{12b}.** *Acta chem. scand.*, 1953, **7**, 703-704. [Div. Food Chem., Royal Inst. Technol., Stockholm.]

Ionophoresis of vitamin B_{12b} from *Streptomyces aureofaciens* on paper in an acetate buffer indicated the presence of 8 substances, all active as growth factors for *Bacterium coli* 113-6. One of the main components appeared to correspond with the major component of factor A described by Holdsworth (Abst. 2958, Vol. 23). Another appeared to be pseudovitamin B₁₂. Four of the components moved towards the anode, of which one was probably vitamin B_{12s}. A yellow compound also was observed. The probable identity of the various components is discussed.

A. M. Copping.

475

NYBERG, W. **B₁₂-Vitamin, folic acid och citrovorum-faktorn. [Vitamin B₁₂, folic acid and citrovorum factor.]** *Nord. Med.*, 1953, **50**, 1029-1032. [4. Med. Klin., Helsinki.]

A review.

476

GOLDECK, H. **Vitamin B₁₂ und verwandte Faktoren. [Vitamin B₁₂ and allied factors.]** *Folia haematol.*, 1951-53, **71**, 403-419. [2. Med. Klin., Univ. Hamburg, Eppendorf.]

A review.

477

ERICSON, L. E. and SjöSTRÖM, A. G. M. **Growth factors for *E. coli* 113-3, other than the vitamin B₁₂-group or methionine.** *Acta chem. scand.*, 1953, **7**, 704. [Div. Food Chem., Royal Inst. Technol., Stockholm.]

Substances which caused stimulation of growth in *Bacterium coli* 113-3 were extracted from ants, grasshoppers, millipedes, mushrooms and human blood. The effect of the extracts resembled that of methionine and differed from that of vitamin B₁₂. A component of the extracts which showed an *R_F* value of 0.14 on chromatography in a mixture of butanol, acetic acid and cyanide was thought to be a peptide.—A. M. Copping.

- 478
LATNER, A. L. and McEVoy-BOWE, E. **Observations on the chemical nature of Castle's intrinsic factor.** *Biochem. J.*, 1953, **55**, xxiii. [Dept. Pathol., King's Coll., Newcastle upon Tyne.]
- 479
JUKES, T. H. **Folic acid and vitamin B₁₂ in the physiology of vertebrates.** *Federation Proc.*, 1953, **12**, 633-638. [Lederle Labs. Div., Amer. Cyanamid Co., Pearl River, N.Y.]
- 480
PAOLINO, W. and PINNA-PINTOR, P. **Diversità di azione tra vitamina B₁₂ ed acido folico nei riguardi della evoluzione maturativa dei reticulociti. Azione maturante della vitamina B₁₂. [Difference in the action of vitamin B₁₂ and folic acid on the maturation of the reticulocytes. Maturing action of vitamin B₁₂.]** *Boll. Soc. ital. Biol. sper.*, 1953, **29**, 207-210. [Ist. Patol., Univ. Turin.]
Red cells and reticulocytes were counted every 12 hr. on the day before, and up to 204 hr. after, withdrawal of about one-third of the total amount of blood from 5 rabbits of which 4 were injected with 15 µg. vitamin B₁₂ 36, 60, 84, 108 and 132 hr. after blood letting. The red cell count did not differ significantly among the 5 animals, but the reticulocyte response was less and subnormal in those given vitamin B₁₂. Folic acid given in the same way was without effect on the blood picture. The effect produced by vitamin B₁₂ is considered to have been due to accelerated maturation of the reticulocytes and not to inhibition of haemopoiesis.—E. M. Hume.
- 481
MASCHERPA, P. and ROVATI, L. **Recherches sur le rôle du cobalt dans l'hématopoïèse. [Role of cobalt in haemopoiesis.]** *Bull. Soc. Chim. biol.*, 1953, **35**, 787-790. [Inst. Pharmacodyn., Univ. Pavia.]
Hypochromic, microcytic anaemia with reduction of haemoglobin was produced in rats by means of a diet of cow's milk, and hyperchromic, macrocytic anaemia in rats receiving acetylcholine bromide. Injections were given of Co as chloride or as vitamin B₁₂. In the first type of anaemia, Co chloride increased haemoglobin and to a certain extent erythropoiesis, but vitamin B₁₂ had a negligible effect. In the second type, vitamin B₁₂ had a marked positive effect on erythropoiesis, but Co chloride had no effect.—V. R. Jackson.
- 482
SARACCHI, F. **Ricerche polarografiche sull'eliminazione renale del cobalto somministrato come cloruro e come vitamina B₁₂. [Polarographic studies of renal excretion of cobalt given as the chloride and as vitamin B₁₂.]** *Arch. Sci. biol., Bologna*, 1953, **37**, 221-228. [Ist. Farmacol., Univ. Pavia.]
For 10 days Co was estimated polarographically in the urine of rats given a single subcutaneous injection of 2.5 mg. Co per kg. bodyweight as chloride or as vitamin B₁₂. In 2 rats given chloride, elimination was greatest on the day after injection and was still considerable on the second day. It then decreased sharply and by the ninth day had ceased. The total excreted, as a percentage of that given, was 70 and 72, respectively, for the 2 rats. In the 2 rats given vitamin B₁₂, the amount eliminated was greatest on the first day, but was still relatively large up to the sixth day; elimination ceased by the ninth day. The total percentage found in the urine was 43 and 45.—E. M. Hume.
- 483
JACKSON, J. T., MACHLIN, L. J., BRANDENBURGER, E. A., KELLOGG, W. L. and DENTON, C. A. **Retention of Co 60 labeled vitamin B₁₂ in chickens.** *Proc. Soc. Exp. Biol. Med.*, 1953, **83**, 221-222. [Bur. Animal Indust., U.S. Dept. Agric., Beltsville, Md.]
The vitamin B₁₂ content of whole chicks and their excreta was measured 1 day and 3, 6, 9 and 12 weeks after hatching from eggs which had been injected with 3 µg. of vitamin B₁₂ on the sixth day of incubation. In one group the vitamin B₁₂ contained ⁶⁰Co, in another the vitamin was unlabelled, and in the third no vitamin B₁₂ was given. Up to 6 weeks of age the total vitamin B₁₂ recovered accounted for the radio-activity measured in the body and excreta, and only subsequently was there an increase in the vitamin B₁₂ content of the chick from diet or from intestinal synthesis. After 12 weeks, over 30 per cent. of the injected vitamin B₁₂ was still present as shown by the ⁶⁰Co activity in the body. The chicks hatched from eggs injected with vitamin B₁₂ showed the improved growth response previously reported by Lillie *et al.* (Abst. 413, Vol. 20).—A. M. Copping.
- 484
LANG, C. A., GLEYSTEN, D. M. and CHOW, B. F. **The disappearance of radioactivity from the tissues of rats of different ages after subcutaneous administration of radiovitamin B₁₂.** *J. Nutrition*, 1953, **50**, 213-222. [Dept. Biochem., Sch. Hyg. Pub. Health, Johns Hopkins Univ., Baltimore, Md.]
Vitamin B₁₂ containing ⁶⁰Co was injected into young rats aged from 2 to 3 months and old rats of the same stock aged from 14 to 18 months. Urine was collected for 48 hr.; some animals were then killed and others were killed 14 days after the injection. The distribution of radio-active

vitamin B₁₂ in the urine, liver and kidneys was the same in young and old animals after 48 hr. but after 14 days the old rats showed a greater amount of radio-activity in the kidney but not in the liver.

A. M. Copping.

485

CHARKEY, L. W., MANNING, W. K., KANO, A. K., GASSNER, F. X., HOPWOOD, M. L. and MADSEN, I. L. **A further study of vitamin B₁₂ in relation to amino acid metabolism in the chick.** *Poultry Sci.*, 1953, **32**, 630-642. [Dept. Chem., Colorado Agric. and Mech. Coll., Fort Collins.]

Day-old chicks of both sexes from hens depleted of vitamin B₁₂ were given basal diets low in the vitamin, with soya bean protein or groundnut cake as source of amino-acids, and with or without a supplement of vitamin B₁₂. All birds were fasted for 48 hr. during the 4th week of the experiment to ascertain the effect of increasing the demand of the tissues for amino-acids. The thyroid glands and gonads were weighed to find whether vitamin B₁₂ exerted its influence through them or not. Lysine, methionine, arginine, tryptophan and histidine were estimated microbiologically.

On the diet containing soya bean protein, growth, utilisation of feed and response to vitamin B₁₂ were greater than on the diet containing groundnut meal. The amino-acid content of the blood reflected the dietary intake of amino-acids, and the effect was discernible even after fasting, particularly with arginine and methionine. Vitamin B₁₂ increased the blood value for arginine and methionine, but had no effect on that for lysine, tryptophan and histidine; the effect was independent of the diet given. In the conditions of the experiment the effect of vitamin B₁₂ was not greater after fasting than before. Irrespective of previous diet, fasting reduced the blood values for arginine, methionine, tryptophan and histidine, but appreciably increased that for lysine. Lysine regained its original value within 4 hr. after food was given, and the values for the other amino-acids were higher than in the pre-fasting period.

None of the criteria associated with sex showed any difference dependent on the presence of vitamin B₁₂. The weight of the gonads and thyroid glands relative to bodyweight was reduced by fasting; total blood solids and thyroid iodine increased.—E. M. Cruickshank.

486

STEKOL, J. A., HSU, P. T., WEISS, S. and SMITH, P. **Labile methyl group and its synthesis de novo in relation to growth in chicks.** *J. Biol. Chem.*, 1953, **203**, 763-773. [Lankenau Hosp. Res. Inst., Philadelphia, Pa.]

Pullets, 3 days old, in groups of 6 to 10, received

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a basal diet deficient in choline and methionine, containing, per cent., soya bean protein 23, maize starch 61.7, salt mixture 6, maize oil 5, succinylsulphathiazole 1.0, L-cystine 0.3, glycine 1.0 and agar 2, with added vitamins except vitamin B₁₂. Groups of them received supplements of homocystine, dimethylethanolamine, betaine and vitamin B₁₂, singly or in combination, for 5 weeks, after which each received a single intraperitoneal injection of radio-active methionine-CH₃-¹⁴C, choline-CH₃-¹⁴C, or betaine-CH₃-¹⁴C, and was killed 20 hr. later.

With all the diets addition of vitamin B₁₂ increased the rate of growth. Homocystine and dimethylethanolamine enhanced the effect of vitamin B₁₂. The best growth was obtained with all 4 supplements together, but homocystine, dimethylethanolamine and betaine without vitamin B₁₂ gave good growth. No perosis was seen in any bird which received dimethylethanolamine, but all other groups showed some degree of perosis, which was not correlated with rate of growth.

Isolation of radio-active choline, creatine and creatinine from the carcasses indicated that transfer of ¹⁴C from methyl groups of methionine or betaine to choline or creatine, or from choline to creatine, was not dependent on dietary vitamin B₁₂. ¹⁴C was incorporated into creatine from choline less efficiently than from methionine or betaine. Addition of homocystine to the basal diet increased transfer of ¹⁴C from choline and betaine to creatine. Synthesis of the labile methyl group in the absence of dietary methionine and choline is thought to be adequate provided that homocystine with vitamin B₁₂ or betaine is present.

D. Duncan.

487

ARNSTEIN, H. R. V. and NEUBERGER, A. **The effect of cobalamin on the quantitative utilization of serine, glycine and formate for the synthesis of choline and methyl groups of methionine.** *Biochem. J.*, 1953, **55**, 259-271. [Nat. Inst. Med. Res., Mill Hill, London.]

The synthesis of methionine and choline from [α -¹⁴C]glycine, [β -¹⁴C]serine or [¹⁴C]formate was studied in prolonged experiments with rats receiving basal diets containing mixtures of amino-acids with or without addition of vitamin B₁₂. In all the tests the radio-activity of the methyl groups in methionine exceeded that of the methyl groups in choline, suggesting that the new synthesis of methyl groups was primarily for incorporation into methionine with later transference to choline by transmethylation. When radio-active serine was given with vitamin B₁₂ in diets lacking preformed methyl groups, 70 per cent. of the radio-activity was found in the methionine of the viscera. Glycine was relatively inefficient as a methyl precursor and formate was efficient although it

was not readily converted to the hydroxymethyl group of serine. The presence of vitamin B₁₂ stimulated the synthesis of methyl groups from all three sources and the effect was found also in rats pair-fed with those deprived of the vitamin.

A. M. Copping.

488

BEST, C. H., LUCAS, C. C., PATTERSON, J. M. and RIDOUT, J. H. **Some effects of vitamin B₁₂ in weanling rats consuming hypolipotropic diets.** *Canad. J. Med. Sci.*, 1953, **31**, 135-145. [Banting and Best Dept. Med. Res., Univ. Toronto, Ont.]

In an investigation of the protective effect of vitamin B₁₂ against haemorrhagic kidney lesions in very young rats having a diet lacking in choline, it was found that protection occurred only when methionine was present in the diet, and the requirement for methionine remained even when subprotective amounts of choline were present. Homocystine could not replace methionine. The effects were demonstrable only in weanling rats and under closely defined conditions. The problems involved in the processes of synthesising labile methyl groups and in the transfer of such groups are discussed with reference to hypolipotropic diets.—A. M. Copping.

489

KRATZER, F. H. **The relation of vitamin B₁₂ to the methylation of homocystine in poults.** *J. Biol. Chem.*, 1953, **203**, 367-371. [Dept. Poultry Husbandry, Coll. Agric., Univ. California, Davis.]

A diet almost completely devoid of methionine was given to turkey poults from hens receiving diets lacking animal protein and vitamin B₁₂. Addition of methionine to the diet improved growth, but homocystine gave only poor growth. A combination of homocystine and vitamin B₁₂ or betaine was more successful, and good results were obtained with the three together. When betaine was given without vitamin B₁₂ growth was fair but mortality was high. It is concluded that the turkey poult could methylate homocystine in presence of vitamin B₁₂ or of a methyl donor such as betaine in absence of the vitamin.

A. M. Copping.

490

ANDERSON, E. I. and STEKOL, J. A. **Vitamin B₁₂ and folic acid in the biosynthesis of component amino acids of glutathione.** *J. Biol. Chem.*, 1953, **202**, 611-618. [Lankenau Hosp. Res. Inst., Philadelphia, Pa.]

Rats 2 to 2½ months old were given stock diet, complete synthetic diet, or diets lacking in vitamin B₁₂ or folic acid, for at least 3 months before radio-active glycine or L-cysteine was injected. The

rats were killed one hour after the injection and the glutathione content of the livers was estimated. The radio-activity of the isolated glutathione was then measured. Although deprivation of vitamin B₁₂ or folic acid caused an apparent reduction of the glutathione content of the liver, the amount of radio-active glycine or L-cysteine incorporated into the glutathione was about the same in rats on complete and deficient diets. In rats deprived of vitamin B₁₂ or folic acid less carbon of glycine-2-¹⁴C was incorporated into the cysteine and glutamic acid portions of the liver glutathione. It is suggested that although vitamin B₁₂ and folic acid are probably not involved directly in the synthesis of glutathione, both may be involved in the conversion of glycine-2-¹⁴C to cysteine and glutamic acid.—A. M. Copping.

491

WILLIAMS, J. N. (Jr.), MONSON, W. J., HARPER, A. E. and ELVEHJEM, C. A. **Further studies on the relationship of vitamin B₁₂ to enzymes in rat liver.** *J. Biol. Chem.*, 1953, **202**, 607-610. [Dept. Biochem., Coll. Agric., Univ. Wisconsin, Madison.]

Weanling male rats were given a basal soya bean meal diet with or without a supplement of 2 µg. vitamin B₁₂ per 100 g. diet. After 5 weeks there was a difference of about 40 g. between the average bodyweights of the 2 groups, and the xanthine oxidase and transmethylese activities were less in the livers of those deprived of vitamin B₁₂. Injections of 2 µg. vitamin B₁₂ were then given to all the rats and enzyme activities were estimated in the livers from rats killed after 24 hr. or 4 or 8 days. The xanthine oxidase activity was only gradually restored but the betaine-homocysteine transmethylese system was restored within 24 hr. It was concluded that vitamin B₁₂ may act as a co-factor in the transmethylese system but its effect on xanthine oxidase is probably indirect and exercised through changes in general protein metabolism.—A. M. Copping.

492

ROLAND, J. F. (Jr.), MILLMAN, I. and GIFFEE, J. W. (Jr.) (with SIPOS, E.). **Fractional electrical transport studies of vitamin B₁₂ binding by proteins.** *J. Biol. Chem.*, 1953, **202**, 857-863. [Dept. Biochem. Res., Armour Labs., Armour and Co., Chicago, Ill.]

The method of Bird and Hoevet (Abst. 1850, Vol. 21) was used to measure the ability to bind vitamin B₁₂ of protein components separated from pig duodenal preparations by iso-electric fractionation by electrical transport in an apparatus similar to that described by Spies *et al.* (*J. Amer. Chem. Soc.*, 1940, **62**, 1420). The component of pig duodenal preparations responsible for the

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greatest part of the vitamin-B₁₂-binding activity was acidic; the iso-electric point was at pH 4.6 and was not altered by combination with vitamin B₁₂. The ability of preparations from plasma and stomach of pigs to bind vitamin B₁₂ was investigated, and that from the plasma was the less active in similar conditions.—A. M. Copping.

493

GREGORY, M. E. and HOLDSWORTH, E. S. **The combination of some vitamin B₁₂-like compounds with sow's whey and 'intrinsic factor' concentrates.** *Biochem. J.*, 1953, **55**, ix-x. [Nat. Inst. Res. Dairying, Univ. Reading.]

494

BECK, E. M. and RALLI, E. P. **Influence of dietary factors and the adrenal on hyaluronidase spreading reaction in the rat.** *Proc. Soc. Exp. Biol. Med.*, 1953, **83**, 588-591. [Dept. Med., Coll. Med., Univ. New York.]

The intradermal spread of injected hyaluronidase was decreased in rats given large amounts of vitamin B₁₂ in the diet. It was not affected by excess or deficiency of pantothenic acid. The area of spread was decreased in adrenalectomised rats and in intact rats given cortisone. Sham operation without removal of the adrenal glands also decreased the area of spread. It is, therefore, suggested that the effect of adrenalectomy is non-specific and related to the operative procedure.

A. M. Copping.

495

BECK, E. M. and RALLI, E. P. **The influence of dietary factors on the hyaluronidase spreading reaction in intact and adrenalectomized rats.** *J. Clin. Endocrinol.*, 1953, **13**, 844. *Proc. [Dept. Med., Coll. Med., Univ. New York.]*

496

VAN KLAVEREN, F. W. and SHRIVASTAVA, P. C. **The lead anaemia in the rabbit and the potency of liver extracts.** *Indian J. Med. Res.*, 1952, **40**, 495-504. [Res. Lab., Teddington Chemical Factory, Ltd., Andheri, Bombay.]

Injection of 4 to 6 mg. lead acetate per kg. body-weight for 2 or 3 days produced severe anaemia in rabbits. If whole liver extract was injected in small doses at the same time as the lead acetate, the decrease in red blood cells and in Hb was checked and the effect appeared to be related to the vitamin B₁₂ content of the liver extract. In a further test which included 2 animals given crystalline vitamin B₁₂, the protective effect of a liver extract was greater than could be explained by its vitamin B₁₂ content. A purified liver fraction containing no vitamin B₁₂ produced a rise in red cell count when it was given with lead acetate.—A. M. Copping.

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497

BALDISSERA NORDIO, C. **Influenza della vitamina B₁₂ nell'anemia da cipolle.** [Effect of vitamin B₁₂ on onion anaemia.] *Zootec. Vet.*, 1953, **8**, 243-248. [Ist. Zootec., Univ. Milan.]

Three rabbits were given a diet of 500 g. cooked onion and 100 g. mixed cereals daily. After 35 days Hb and erythrocyte count were considerably reduced. In one animal, simple removal of the onion from the diet permitted rapid recovery. The second animal had the onion withdrawn and vitamin B₁₂ administered with no greater recovery rate. The third animal was kept on the onion diet and given vitamin B₁₂, which produced only partial recovery. It was concluded that the toxic effect was exercised on the bone marrow.

A. M. Copping.

498

BALDISSERA NORDIO, C. **Nuove ricerche su l'anemia da *Allium cepa*.** [Further research on the anaemia produced by *Allium cepa*.] 1. Azione della vitamina B₁₂ nell'anemia da cipolle. [1. Action of vitamin B₁₂ in onion anaemia.] 2. Alterazioni del quadro ematico nel cane per moderate quantità di cipolle. [2. Changes in the blood picture of dogs given moderate amounts of onions.] *Boll. Soc. ital. Biol. sper.*, 1953, **29**, 12-14; 14-15. [Ist. Zootec., Univ. Milan.]

1. See preceding Abst.

2. Four dogs weighing from 14 to 20 kg. were given daily 1 kg. skimmed milk, from 300 to 500 g. bread and 30 g. minced meat with 2, 4, 6, or 8 g. cooked onion per kg. bodyweight. Additional meat was given twice a week. Blood examinations were made beforehand and after 7 and 14 days of the diet. All the dogs became to some extent anaemic, the one on the smallest amount of onion only slightly so.—E. M. Hume.

499

DANIEL, L. J. and GRAY, L. F. **Molybdenum toxicity in *Lactobacillus leichmannii*.** *Proc. Soc. Exp. Biol. Med.*, 1953, **83**, 487-490. [Dept. Biochem. Nutrit., Cornell Univ., Ithaca, N.Y.]

With large amounts of molybdenum, 40 to 80 mg. per 10 ml. medium, the growth of *Lactobacillus leichmannii* was inhibited, but the inhibition was rapidly overcome by relatively small doses of vitamin B₁₂. Co alone did not have the effect of vitamin B₁₂. Addition of cysteine, glutathione or BAL to the medium decreased the inhibition caused by Mo, owing, it is suggested, to formation of Mo mercaptides. The action of vitamin B₁₂ was less easily explained unless it was concerned in maintaining a reduced state in sulphhydryl enzymes or in maintaining or producing phosphate bonds.

A. M. Copping.

500

MIRONE, L. **Aureomycin-vitamin B₁₂. Influence on growth, moisture, fat, and nitrogen content.** *J. Agric. Food Chem.*, 1953, **1**, 519-520. [Univ. Georgia, Athens, Ga.]

A basal diet containing 30 per cent. purified casein and synthetic vitamin supplements was further supplemented per kg. with 5 µg. vitamin B₁₂ alone or with 25, 50 or 100 mg. aureomycin, or with the aureomycin and no vitamin B₁₂. The diets were given to 8 groups of 10 male and 10 female dba mice, and half of each group was killed after 5 weeks and half after 10 weeks. Estimation of moisture, fat and N indicated that in the female body composition was not affected by aureomycin with or without vitamin B₁₂. In the male, fat increased and moisture and N decreased with aureomycin. Aureomycin with or without vitamin B₁₂ had no effect on the daily growth rate of male or female mice.—A. M. Copping.

501

FERRIOT, A., QUENTIN, J. and ROBERT, J. **Vitamine B₁₂ et antibiotiques dans la nutrition animale. 2. Essai dans l'élevage du porc. [Vitamin B₁₂ and antibiotics in the nutrition of animals. 2. Test in pig rearing.]** *Rec. Méd. vét.*, 1953, **129**, 226-238.

A test was made of the value of supplements of vitamin B₁₂ and aureomycin or other antibiotic in commercial pig rearing with diets based on by-products of the dairy industry, including whey and skimmed milk. The pigs given the supplements showed a higher rate of growth with a relatively lower feed consumption. The use of antibiotics improved the general condition of the pigs and prevented diarrhoea and other troubles. The meat produced by the supplemented diets was of high quality as pork and ham.

A. M. Copping.

502

HUANG, T. C., SCHNEIDER, B. H. and COLBY, R. W. **Alfalfa, soil, vitamin B₁₂ and antibiotics in the nutrition of young pigs.** *Arch. Biochem. Biophys.*, 1953, **45**, 254-259. [Dept. Animal Husb., State Coll. Washington, Pullman.]

Weanling pigs were given basal diets containing 57.6 per cent. sucrose and 26.2 per cent. vitamin-free casein or α-protein, with vitamin and mineral supplements except vitamin B₁₂. Addition of 10 per cent. alfalfa meal did not improve growth or feed utilisation during a 5-week test but over 13 weeks it did. Alfalfa and vitamin B₁₂ together were more effective than alfalfa alone. Palouse silt loam topsoil improved growth and feed utilisation when it was added to the diet at the rate of 5 per cent. but not of 1 or 3 per cent. Previous incubation of the soil with chopped straw and

cobalt carbonate increased its growth-promoting effect. A supplement of 33 mg. terramycin per kg. diet was effective in improving the diet containing α-protein. Vitamin B₁₂ alone had little effect on growth and feed utilisation. The growth and feed utilisation of pigs kept in cages to prevent coprophagy were poorer than of pigs on a concrete floor and given the same diet.—A. M. Copping.

503

BALDINI, J. T., ROBERTS, R. E. and KIRKPATRICK, C. M. **Antibiotic and vitamin B₁₂ supplements as related to the crude protein level of bobwhite quail diets.** *Poultry Sci.*, 1953, **32**, 563-567. [Dept. Poultry Husb., Purdue Univ. Agric. Exp. Stat., Lafayette, Ind.]

When quail were given a vegetable diet containing 20 per cent. protein, a supplement of condensed fish solubles improved growth and survival. When the fish solubles were combined with an antibiotic and vitamin B₁₂, growth was further increased and was equal to that when the diet contained 28 per cent. protein without any supplement. When the dietary protein was 24 or 28 per cent. the supplements alone or combined had no beneficial effect. The addition of an antibiotic and vitamin B₁₂ increased the efficiency of utilisation of feed and of protein, particularly when the dietary protein was only 20 per cent.

E. M. Cruickshank.

504

HANSEN, M. F., NORRIS, M. G. and ACKERT, J. E. **The influence of an all plant protein diet supplemented with aureomycin and vitamin B₁₂ on the resistance of chicks to *Ascaridia galli* (Schränk).** *Poultry Sci.*, 1953, **32**, 612-617. [Dept. Zool., Kansas State Coll., Manhattan.]

Chicks given an adequate vegetable ration with or without 0.9 mg. aureomycin and 0.9 mg. vitamin B₁₂ per 100 lb. feed were left untreated or given by mouth 100 ± 10 embryonated ova of *Ascaridia*. The mortality and the percentage of birds infected were less in those receiving the supplement. There was no significant difference in liveweight increase between infected and non-infected birds when they received the basal diet, but when the diet was supplemented parasitism had a detrimental effect on weight gain. The worm burden was heavier in chicks receiving the basal ration alone.

E. M. Cruickshank.

505

LASSITER, C. A., WARD, G. M., HUFFMAN, C. F., DUNCAN, C. W. and WEBSTER, H. D. **Crystalline vitamin B₁₂ requirement of the young dairy calf.** *J. Dairy Sci.*, 1953, **36**, 592. *Proc. [Michigan State Coll., East Lansing.]*

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506

DANIEL, L. J., GARDINER, M. and OTTEY, L. J. **Effect of vitamin B₁₂ in the diet of the rat on the vitamin B₁₂ contents of milk and livers of young.** *J. Nutrition*, 1953, **50**, 275-289. [Dept. Biochem., Cornell Univ., Ithaca, N.Y.]

Young rats, from females which from 12 weeks of age had received a stock diet or a basal diet including 60 per cent. soya bean oilmeal and 1 per cent. succinylsulphathiozole, without vitamin B₁₂, or with 0.2 µg. or 20 µg. vitamin B₁₂ per 100 g. diet, were killed at 2 or 22 days of age. The curds in the stomach and the livers were tested for vitamin B₁₂ with *Lactobacillus leichmannii*. Even at 2 days of age the amount of vitamin B₁₂ in the livers was related to the amount in the maternal diet, which was taken to indicate that vitamin B₁₂ was transferred from mother to foetus in prenatal life. The vitamin B₁₂ content of the milk varied also with the maternal diet and was greater after 2 days than at the end of lactation. In young killed at 22 days of age vitamin B₁₂ in the liver had increased over the values found for littermates 2 days old except in the young of mothers given the unsupplemented diet, which showed a decrease in liver stores of vitamin B₁₂. Birthweights and weaning weights were related to the vitamin B₁₂ content of the diet but even with 20 µg. vitamin B₁₂ per 100 g. diet the weaning weights were not equal to those obtained on stock diet.

Second and third litters were obtained from some of the females on the purified diets but the reproductive performance was poor after the first litter. Those which achieved 3 lactations were killed and vitamin B₁₂ was measured in their livers. There was significantly less in rats given no vitamin B₁₂ than in those given a supplement, but even with 20 µg. per 100 g. diet there was less in the liver than in the liver of animals given the stock diet.—A. M. Copping.

507

HALICK, J. V., REID, B. L., BROWN, C. L. and COUCH, J. R. **The vitamin B₁₂ content of egg yolks as influenced by oral and parenteral administration of the vitamin.** *J. Nutrition*, 1953, **50**, 331-340. [Dept. Poultry Husb., Texas Agric. Exp. Stat., College Station.]

In 4 series of tests with white Leghorn pullets, the effect was studied of intramuscular injection of a daily dose of 250 µg. vitamin B₁₂, direct oral administration of the same dose, or inclusion of 1750 µg. per kg. in the diet. The highest increase in the vitamin B₁₂ content of the egg yolk occurred

when the vitamin was injected. There appeared to be considerable loss or destruction of it when ingested. Addition to the diet of a surface-active agent, a polyoxylene oxide-substituted amine, enhanced the absorption of vitamin B₁₂ and increased the amount appearing in the egg yolk. Eggs containing large amounts of vitamin B₁₂ hatched normally, and the chicks had much greater stores of vitamin B₁₂ in the liver than chicks from eggs with a normal vitamin B₁₂ content. The addition of the surface-active agent to the diet did not affect hatching capacity.

A. M. Copping.

508

FORD, J. E., HOLDSWORTH, E. S. and PORTER, J. W. G. **The occurrence of cyanocobalamin and related compounds in natural materials.** *Proc. Nutrit. Soc.*, 1953, **12**, xi-xii. [Nat. Inst. Res. Dairying, Univ. Reading.]

509

SOUTHCOTT, B. A. and TARR, H. L. A. **Vitamin B₁₂ in marine invertebrates and seaweeds.** *Fish. Res. Board Canada, Progr. Rep. Pacific Coast Stat.*, 1953, No. 95, 45-47. [Pacific Fish. Exp. Stat., Nanaimo, B.C.]

By paper chromatography and bio-autography it was shown that an acid extract of the clam, *Saxidomus giganteus*, contained some true vitamin B₁₂ as well as other active components related to it. Extracts from seaweeds, collected before the season of most vigorous growth, contained small amounts of vitamin B₁₂.—A. M. Copping.

510

BÄNHIDI, Z. G. and ERICSON, L. E. **Bioautographic separation of vitamin B₁₂ and various forms of folic acid occurring in some brown and red seaweeds.** *Acta chem. scand.*, 1953, **7**, 713-720. [Div. Food Chem., Royal Inst. Technol., Stockholm.]

Further studies were made of the growth factors in seaweeds (Abst. 4384, Vol. 23) by chromatographic and bio-autographic methods. Of the 6 algae tested none appeared to contain vitamin B₁₂, but *Laminaria saccharina*, *Polysiphonia nigrescens* and *Rhodomela subfusca* contained vitamin B_{12b}.

Several deoxyribosides were detected in all 6 algae. In all except *Rhodomela subfusca* a citrovorum factor resembling formyltetrahydrofolic acid was identified. Several slowly moving spots were observed in the chromatograms, and similar products were obtained from a yeast extract but not from a horse liver extract.—A. M. Copping.

See also Absts. 167, 291, 318, 524, 1355, 1368.

OTHER B VITAMINS

511

TAPPAN, D. V., BOLDT, R. E. and ELVEHJEM, C. A. **Unidentified factors capable of reducing stress in iodinated protein-fed rats.** *Proc. Soc. Exp. Biol. Med.*, 1953, **83**, 135-139. [Dept. Biochem., Univ. Wisconsin, Madison.]

Male weanling albino rats received a basal diet containing casein 20 to 24, cystine 0.3, salt mixture 4, maize oil 5 and iodinated casein (Protamone) 0.15 to 0.5, with sucrose to 100, supplemented by adequate vitamins including 0.1 mg. vitamin B₁₂ per kg. Other groups received the diet with natural materials replacing equivalent amounts of casein, cystine and maize oil so that the levels of protein and fat were kept the same as in the basal diet.

In diets with 0.4 to 0.5 per cent. Protamone, survival was significantly prolonged by including in the diet pork protein, the antithyrototoxic activity of which was not removed by extraction with

ether and then water. A mixture of maize and soya bean replacing all the non-iodinated casein and sucrose of the basal diet gave even greater protection. Other active materials included muscle from other mammals, alfalfa leaf meal, yeast and whole liver. Dried egg and dried haddock, whole wheat, milk powder, crude casein, maize or soya bean meal as 20 per cent. of the diet, liver concentrates or cellulose had only slight protective activity.

Animals receiving the basal diet unmodified showed atrophy of the thymus and seminal vesicles and enlargement of the kidneys and adrenal glands, disorders which were reduced by the more protective materials, though, in the case of the adrenal glands, only if the Protamone content of the diet was low. The spleen was larger in the animals receiving protective materials

V. R. Jackson.

VITAMIN C (ASCORBIC ACID)

512

TOBIAS, J., WHITMAN, D. W. and HERREID, E. O. **Evaluation of the 2, 4 dinitrophenylhydrazine test for vitamin C in milk.** *J. Dairy Sci.*, 1953, **36**, 573. *Proc.* [Univ. Illinois, Urbana.]

513

OGAWA, S. **[Fluorescent reaction of vitamin C. 2. Design of fluorophotometer. 3. 4. Its application to filter paper chromatography.]** *J. Pharm. Soc. Japan*, 1953, **73**, 54-58; 59-63; 94-99. [Nat. Hyg. Lab., Tokyo.] English summary.

2. Details are given of how to construct a fluorophotometer for estimating the intensity of the violet-indigo fluorescence produced by dehydroascorbic acid and *o*-phenylenediamine.

3. The fluorescence reactions that occur between dehydroascorbic acid, oxidation-type reductone and α -keto-acid, with *o*-phenylenediamine showed that the reaction was specific for detecting dehydroascorbic acid, of which as little as 5 μ g. could be detected.

4. Evidence obtained with this reaction supported the hypothesis of Herbert *et al.* (Abst. 2943, Vol. 3) and of Penney and Zilva (Absts. 2159, Vol. 13; 1399, Vol. 15) rather than that of Ghosh and Rakshit (Abst. 4638, Vol. 8) or Rosenfeld (Abst. 3071, Vol. 13).—K. H. Coward.

514

OGAWA, S. **[Fluorescent reaction of vitamin C. 5. Mechanism of the reaction. 6. Fluorimetric determination of total vitamin C. 7.**

Total vitamin C in fresh plant tissues.] *J. Pharm. Soc. Japan*, 1953, **73**, 309-326. [Nat. Hyg. Lab., Tokyo.] English summary.

515

BALAKHOVSKII, S. D., DROZDOVA, N. N. and FEDOROVA, V. N. **O vliyanii karotina na okislenie askorbinovoi kisloty v prisutstvii medi.** [The effect of carotene on the oxidation of ascorbic acid in presence of copper.] *Biokhimiya*, 1953, **18**, 112-119. [Inst. Biochim. Im. A.N. Bakh., Akad. Nauk SSSR, Moscow.]

It has been shown experimentally that colloidal aqueous solutions of carotene can inhibit the catalytic oxidation of ascorbic acid in the presence of Cu. The inhibition cannot be explained by competition for oxygen. The carotene exerts this negative catalytic effect only when it is in a particular state of subdivision, and a method is described for preparing carotene solutions which retain their vitamin activity after several months' storage. In the experimental conditions the oxidation of carotene in aqueous media was not accelerated by Cu. A mixture of ascorbic acid and Cu stabilised colloidal aqueous solutions of carotene to a slight extent.—W. Hughes.

516

GUTHRIE, E. S. **Ascorbic acid and oxidized flavors.** *J. Dairy Sci.*, 1953, **36**, 572. *Proc.* [Cornell Univ., Ithaca, N.Y.]

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517

- SOHONIE, K. and GUTTIKAR, M. N. **Stability of ascorbic acid in neera from date palm (*Phoenix silverstres*).** *Proc. Indian Acad. Sci. [B]*, 1953, **37**, 167-173. [Dept. Biochem., Inst. Sci., Bombay I.]

Samples of *neera* (toddy) from date palm (*Phoenix sylvestris*) have been shown to contain a high concentration of sulphhydryl compounds and of dehydroascorbic acid reductase. The stability of ascorbic acid in *neera* previously reported (*Curr. Sci.*, 1952, **21**, 137) is attributed to the presence of these associated substances.—W. Godden.

518

- WATTS, J. H. and GRISWOLD, R. M. **Enzyme inactivation, relation of rates of inactivation of peroxidase, catecholase, and ascorbase to oxidation of ascorbic acid in potatoes and parsnips.** *J. Agric. Food Chem.*, 1953, **1**, 569-574. [Dept. Home Econ., Univ. Chicago, Ill.]

Potatoes and parsnips were steamed, boiled, cooked under pressure or baked to internal temperatures between 25° and 90° C. Catecholase was estimated in potatoes, peroxidase and ascorbic acid oxidase in parsnips, and ascorbic acid in both vegetables, before and after cooking. The rate of enzyme inactivation could not be related to the amount of ascorbic acid retained in either cooked potatoes or parsnips.—W. Godden.

519

- RUFFO, A. A proposito dell'ossidazione biologica dell'ac. ascorbico. [**Biological oxidation of ascorbic acid.**] *Boll. Soc. ital. Biol. sper.*, 1952, **28**, 1848-1849. [Ist. Chim. Biol., Univ. Naples.]

A solution of ascorbic acid of concentration 0.05 M was oxidised in presence or absence of a suspension of rat liver tissue more rapidly at pH 8.0, 9.0 and 10.0 than at pH 6.0 and 7.0. In presence of the suspension of liver tissue, oxidation at pH 8.0 and 9.0 was somewhat more rapid than in its absence.—E. M. Hume.

520

- NATH, M. C., BELAVADY, B., SAHU, V. K. and CHITALE, R. P. **Biosynthesis of vitamin C: a new precursor.** *Proc. Soc. Exp. Biol. Med.*, 1953, **83**, 39-42. [Dept. Biochem., Univ. Nagpur, India.]

The first part of the paper is a more detailed account of work already published (Abst. 1715, Vol. 23). The intramuscular injection of glucose, sodium acetate alone or followed immediately by glucose, or the condensation product of glucose and ethyl acetoacetate, caused a temporary rise in the plasma value for ascorbic acid within an

hour. The rise was most marked with the condensation product. Only when sodium acetoacetate alone was used was the rise followed by a fall at the end of 4 hr.—W. Godden.

521

- BROWN, D., FERGUSON, I. D. and RAMSAY, A. G. **Guinea-pigs reared on a diet containing synthetic ascorbic acid.** *J. Physiol.*, 1953, **121**, 36P-37P. [Inst. Physiol., Univ. Glasgow.]

522

- DE FELICE, F. **Variazioni ponderali di organi di cavia a dieta scorbutogena, nel corso dell'allenamento al nuoto. [Changes in the weight of the organs of guineapigs on a scorbutic diet, while learning to swim.]** *Boll. Soc. ital. Biol. sper.*, 1953, **29**, 141-143. [Ist. Fisiol., Univ. Bari.]

Twenty-seven male guineapigs weighing about 250 g. were maintained on a scorbutogenic diet and killed at intervals up to 24 days. One group was maintained at rest; the remainder were caused to swim for 30 min. daily, half of them being killed immediately after exercise and half after 24 hours' rest. Certain of the organs were weighed. In the animals made to take exercise the weight of the organs relative to bodyweight tended to increase.—E. M. Hume.

523

- PERSSON, B. H. **Studies on connective tissue ground substance. 1. Histochemical features of ground substance mucopolysaccharides. 2. Organization of the ground substance in ascorbic acid deficiency and its modification by the action of cortisone.** *Acta Soc. Med. upsalien.*, 1953, **58**, Suppl. 2, 1-104. [Dept. Histol., Univ. Uppsala, Sweden.]

1. The first part of the paper is concerned with a study of the metachromatic potency of purified samples of hyaluronic acid and chondroitin sulphuric acid, of commercial heparin and of some native samples of vitreous humour and synovial fluid. The metachromatic potency of hyaluronic acid depends on its state of polymerisation and is affected by the purity of the histochemical dyes used. Failure to take this into account may explain some of the differences between findings recorded in the literature.

2. The effect of ascorbic acid deficiency and of cortisone on the organisation of the connective tissue ground substance in growing female guineapigs was studied with the aid of these and other tests. In scurvy an increased amount of ground substance mucopolysaccharides was found, the hexosamine in the skin being increased significantly in comparison with normal animals. The ground substance complex was present in an abnormal

state, with high solubility in water, and increased permeability to penetrating agents. The water-binding capacity of the skin was increased also. In healing wounds, water-soluble ground substance was found in the granulation tissue. It did not show any metachromatic potency but reacted with Hale's colloidal iron, and with Schiff's leucofuchsin after oxidation with periodic acid. Removal of the adrenal glands aggravated the signs of scurvy and treatment of the scorbutic animal with cortisone tended to reverse the above findings.

W. Godden.

524

WU, M. C. C. and SEALOCK, R. R. **Factors concerned in tyrosine metabolism.** *Arch. Biochem. Biophys.*, 1953, **44**, 312-319. [Dept. Chem., Iowa State Coll., Ames.]

Male guineapigs received a commercial chow diet in which vitamin C had been destroyed by exposure to air. In a first experiment, after 3 days on the diet, the animals received a supplement of 200 mg. L-tyrosine per 100 g. bodyweight daily, with 0.9 g. brewer's yeast. Urine samples were analysed daily; when keto-acid excretion represented at least 30 per cent. of the extra tyrosine, single or repeated intraperitoneal injections of from 20 to 30 μ g. vitamin B₁₂ were given; they reduced the excretion of tyrosine metabolites, but smaller doses were ineffective.

In a second experiment the duration of vitamin C deprivation before the administration of tyrosine was varied from one to 14 days. The effect of vitamin B₁₂ decreased with increasing vitamin C deficiency and after 10 days was reversed, so that keto-acid excretion increased after vitamin B₁₂ injection. There was no clear correlation between vitamin C concentration in the tissues and vitamin B₁₂ effect, though a high concentration of vitamin C in the liver and kidneys seemed to favour the effect.

When folic acid replaced vitamin B₁₂, keto-acid excretion was reduced, but the dose required increased as vitamin C depletion progressed. A series of small doses of folic acid had a cumulative action. It is suggested that the actions of vitamin C and folic acid are closely linked in tyrosine metabolism.—V. R. Jackson.

525

VERNE, J., HEBERT, S. and BARBARIN, Y. **Étude cytochimique des rapports entre l'activité estérasiqne et l'acide ascorbique chez le cobaye. [Cytochemical study of the relation between esterase activity and ascorbic acid in the guineapig.]** *C.R. Soc. Biol.*, 1953, **147**, 412-413. [Inst. Nat. Hyg., Paris.]

Cytochemical study by means of the Gomori reaction with Tween showed that the esterase

activity in several guineapig tissues varied with the vitamin C status. In vitamin-C-deficient guineapigs, esterase activity was found only in the pancreas and intestine. In guineapigs receiving an excess of vitamin C there was a great increase of esterase activity, especially in the liver, intestine and lungs, but no activity appeared in tissues from which the enzyme is normally absent.

D. Duncan.

526

McKEE, R. W. and WALKER, J. K. **Oxygen consumption of adrenal slices from normal and scorbutic guinea pigs and the influence of added ACTH.** *Science*, 1953, **118**, 133-135. [Cancer Res. Inst., New England Deaconess Hosp., Boston, Mass.]

Oxygen consumption was measured in an atmosphere of O₂ with the slices of adrenal gland in an isotonic inorganic medium and glucose as substrate. The average O₂ consumption, in c. mm. per hr. per 100 mg. wet adrenal slice, was 86 for normal and 141 for scorbutic guineapigs. Addition of 2 mg. adrenocorticotrophic hormone to the Warburg vessel increased normal consumption by 50 per cent., but had no effect on slices from scorbutic animals.—W. Godden.

527

BACCHUS, H. and HEIFFER, M. H. **Urinary corticosteroids and 17-ketosteroids in ascorbic acid-deficient female guinea pigs.** *Amer. J. Physiol.*, 1953, **174**, 243-246. [Dept. Physiol., Sch. Med., George Washington Univ., Washington, D.C.]

Of female guineapigs maintained on a scorbutogenic diet of Purina rabbit chow and tap water, one group received daily 1.33 mg. sodium ascorbate per 100 g. bodyweight by intraperitoneal injection and another group received saline. They were paired. Some of each group were used for blood studies, the remainder for a study of urinary steroids.

The deficient animals showed a progressive decrease in excretion of corticosteroids, but the decrease in excretion of 17-ketosteroids was preceded by a progressive and significant rise for the first 3 days, and the decrease was not significant until the ninth day. Total lymphocytes and eosinophils increased significantly, and total polymorphonuclear neutrophils decreased in deficient animals. There was no change in the blood picture of the non-deprived animals. Lipid depletion and other signs of damage occurred in the adrenal cortex of deficient animals.

Ascorbic acid deficiency is thought to be associated with increased breakdown of adrenal cortical hormone to 17-ketosteroids, and later with reduced cortical activity.—D. Duncan.

N.A. and R., January 1954

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JONES, J. M., LLOYD, C. W. and WYATT, T. C. **A study of the interrelationships of maternal and fetal adrenal glands of rats.** *Endocrinology*, 1953, **53**, 182-191. [Dept. Obstet., State Univ. New York, Syracuse.]

Pregnant rats receiving a stock diet were killed on the twenty-first day of gestation and the maternal and foetal adrenal glands were removed for estimation of ascorbic acid and cholesterol. Values were compared with those for non-pregnant rats. In some animals the effect on these values was studied of exposure to cold, 4° to 6° C., for 12 hr., and of adrenocorticotrophic hormone or cortisone acetate, given over several hours up to a few hours before death.

After exposure to cold, adrenal cholesterol in non-pregnant rats decreased from 4.44 to 3.18 mg. per 100 g. tissue and in pregnant rats from 2.57 to 1.10, but in foetal adrenal glands it increased by 75 per cent. to 1.39 mg. per 100 g.

In non-pregnant rats intravenous injection of adrenocorticotrophic hormone, 0.04 I.U., caused a significant depletion of ascorbic acid, and higher doses had little further effect; adrenal cholesterol was reduced by 35 per cent. by 1.6 I.U. In pregnant rats, from 0.16 to 1.6 I.U. caused a decrease of 25 per cent. in cholesterol and of 50 per cent. in ascorbic acid. In the foetus ascorbic acid was little affected but cholesterol was increased by 58 per cent. when the mother received 0.16 I.U.; with 1.6 I.U. cholesterol was normal and ascorbic acid 25 per cent. below normal.

Administration of 30 mg. cortisone had no effect on the maternal adrenal glands, but in the foetus cholesterol was increased by 70 per cent. and ascorbic acid was unaffected. In the adrenal glands of non-pregnant rats cortisone had no effect on cholesterol and decreased ascorbic acid by 23 per cent. Treatment with cortisone followed by adrenocorticotrophic hormone caused greater decrease of cholesterol and ascorbic acid than with adrenocorticotrophic hormone alone.

It is concluded that adrenocorticotrophic hormone did not cross the placental barrier when given in moderate amounts or under conditions of moderate stress, but that adrenal cortical steroids secreted by the maternal tissues did so pass.

V. R. Jackson.

529

DE FELICE, F. Sul significato delle correlazioni intervitaminiche. [The significance of vitamin interrelationships.] 5. Sul contenuto di acidi ascorbico e deidroascorbico in alcuni organi di cavia in carenza di vitamina C e trattate con acido folico. [5. The content of ascorbic acid and of dehydroascorbic acid in certain organs of guineapigs deprived of vitamin C and treated with folic acid.] 6. Sul contenuto di

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acidi ascorbico e deidroascorbico in alcuni organi di cavia in carenza di vitamina C e trattate con acido *p*-aminobenzoico. [6. The content of ascorbic acid and dehydroascorbic acid in certain organs of guineapigs deprived of vitamin C and treated with *p*-aminobenzoic acid.] *Boll. Soc. ital. Biol. sper.*, 1952, **28**, 1813-1814; 1814-1815. [Ist. Fisiol., Univ. Bari.]

5. Of 20 guineapigs given a scorbutogenic diet with an oral daily dose of 12.5 mg. folic acid, 4 were killed after 3, 5, 10, 20 and 30 days. Another 20 were treated in the same way but without the dose of folic acid. The progressive decrease of ascorbic acid in certain organs and tissues was less rapid in the guineapigs given folic acid, but there was less dehydroascorbic acid present.

6. In a similar experiment *p*-aminobenzoic acid was given instead of folic acid, and a similar result was obtained.—E. M. Hume.

530

BERGERON, G. A., BOURBEAU, G. and DUGAL, L. P. Acide ascorbique et hypertension expérimentale chez des rats hypophysectomisés. [Ascorbic acid and experimental hypertension in hypophysectomised rats.] *Rev. canad. Biol.*, 1953, **11**, 484-490. [Dept. Physiol., Laval Univ., Quebec.]

Rats were rendered hypertensive by removal of one kidney and treatment with deoxycorticosterone acetate. They were given saline to drink. When in addition they were given 40 mg. Na ascorbate four times daily, the effect of the hormone was in part prevented. In hypophysectomised rats treated in the same way, vitamin C produced the same effect. (Cf. Abst. 1945, Vol. 21.)

E. M. Hume.

531

RATSIMAMANGA, A. R. and ZIZINE, L. Contribution à l'étude de l'action de l'hypophyse du cobaye scorbutique sur un organisme hypophysectomisé. [Study of the action of the anterior pituitary of the scorbutic guineapig on a hypophysectomised organism.] *C.R. Soc. Biol.*, 1953, **147**, 378-379. [Fac. Méd., C.N.R.S., Paris.]

532

COSTE, F., DELBARRE, F. and LACRONIQUE, F. Variations du taux de l'acide ascorbique des endocrines sous l'influence des stimulines hypophysaires. Taux de l'acide ascorbique des testicules du rat en fonction de l'âge. [Variations in the level of ascorbic acid in the endocrine glands after stimulation of the anterior pituitary. Level of ascorbic acid in the testes of the rat as a function of age.] Variations du taux de l'acide ascorbique

ovarien, chez la rate, aux différents stades du cycle oestral. [**Variations in the ascorbic acid level of the ovaries in the female rat at different stages of the oestrous cycle.**] *C.R. Soc. Biol.*, 1953, 147, 608-611; 611-613. [Lab. Clin. Rhumatol., Fac. Méd., Paris.]

The ascorbic acid content of the young rat's testis, estimated by indophenol titration, decreased with age, particularly between 21 and 63 days of age. At the usual age of puberty, about 50 to 60 days in Wistar males, the curve reached the adult level of about 26 mg. per 100 g. tissue.

The ascorbic acid content of the ovary was fairly stable in post-oestrus and di-oestrus, decreased sharply in pre-oestrus and recovered during oestrus. It is concluded that the diminution was conditioned by follicular or folliculo-luteal hormones.—D. Duncan.

533

DE BASTIANI, G. and GRANATA, L. Azione diabetogena del trattamento contemporaneo con glucosio ed acido deidroascorbico, nel ratto albino. [**Diabetogenic action for the albino rat of simultaneous treatment with glucose and dehydroascorbic acid.**] *Boll. Soc. ital. Biol. sper.*, 1953, 29, 223-224. [Ist. Fisiol., Univ. Padua.]

Rats of about 100 g. weight were maintained on a normal diet. Twenty were given for from 50 to 60 days a peritoneal injection in 2 doses of glucose increasing from 0.5 to 3 g. Another 20 were treated for 15 days with from 15 to 20 mg. dehydroascorbic acid and then with glucose, as in the first group, as well. A third group of 10 was treated only with dehydroascorbic acid for from 65 to 75 days. Some rats were killed at intervals earlier. There was no change in the blood sugar level or histological appearance of the pancreas except in the rats given glucose and dehydroascorbic acid. In them the fasting blood sugar level was at first low but about the 30th day there was hyperglycaemia in 70 per cent. of the animals, which became progressively worse; in the pancreas there were changes of a diabetic nature, including atrophy of some of the islet tissue.—E. M. Hume.

534

BANERJEE, S., BELAVADY, B. and MUKHERJEE, A. K. **Effect of dehydroascorbic acid in rabbits.** *Proc. Soc. Exp. Biol. Med.*, 1953, 83, 133-135. [Dept. Physiol., Presidency Coll., Calcutta.]

Intravenous injections of 1 or 1.5 g. dehydroascorbic acid per kg. in rabbits caused profuse salivation and lachrymation, dilatation of the pupil and respiratory failure but, contrary to the findings of Patterson (Absts. 1901, Vol. 20; 1962, 4922, Vol. 21), did not cause a persistent high blood

sugar level or persistent diabetic type of glucose tolerance curve. The initial rise in blood sugar level could be prevented by a prior injection of dihydroergotamine methanesulphonate. The rabbits did not excrete sugar in the urine or show any histological change in the pancreas, adrenal or pituitary glands.—W. Godden.

535

MADRID GUTIERREZ, M. Variaciones de la ascorbinemia del conejo diabetizado con aloxano y con distintos regimenes alimenticios. [**Variations in blood ascorbic acid in the alloxan-diabetic rabbit on different diets.**] *An. Fac. Farm. Bioquím., Lima*, 1951, 2, 445-455. [Lab. Hosp. Militar, Univ. Nac. Mayor de San Marcos, Lima.]

Rabbits were made diabetic by injection of 125 mg. alloxan per kg. bodyweight; 150 mg. per kg. was lethal. Ascorbic acid was estimated in the blood of 6 animals before and up to 72 hr. after injection of alloxan. In all there was immediate diminution of the ascorbic acid content with slight further decrease occurring even up to 3 days after the injection. The findings are discussed with reference to their possible bearing on human diabetes.—A. M. Copping.

536

SAPEIKA, N. and PARKER, R. G. F. **Effect of senecio alkaloid pterophine on the structure and ascorbic acid of the rat liver.** *S. African J. Med. Sci.*, 1953, 18, 1-4. [Dept. Physiol., Univ. Cape Town.]

In continuation of earlier work (Abst. 443, Vol. 23) the liver lesions resulting from acute poisoning with the alkaloid, pterophine, from the plant *Senecio* are briefly described and further figures are given to show its effect in reducing the ascorbic acid content of the liver and adrenal glands.—W. Godden.

537

MOON, F. E. and McKEAND, J. M. **Observations on the vitamin C status and haematology of bracken-fed ruminants.** *Brit. Vet. J.*, 1953, 109, 321-326. [Edinburgh and East of Scotland Coll. Agric.]

A bullock fed on a mixture of hay and artificially dried bracken died of bracken poisoning after 44 days. Two sheep fed almost entirely on dried bracken survived for 125 days and 289 days, respectively. The second sheep received vitamin C subcutaneously [amount not stated] daily for 57 days during the 8th to the 16th week. A few haematological observations were made on the first sheep, and at weekly intervals on the second sheep during the last 5 months before death. In none of the animals was there any evidence of a

simple deficiency of vitamin C resulting from bracken feeding although there may have been increased destruction of the vitamin in the terminal stages of the intoxication. The occurrence of leucopenia was confirmed for the sheep, with an indication of deficiency of platelets in the terminal stages. The development of bracken poisoning in the second sheep was more clearly marked by a progressive fall in erythrocytes and haemoglobin.

W. Godden.

538

ALLISON, R. M. and DRIVER, C. M. **The effect of variety, storage and locality on the ascorbic acid content of the potato tuber.** *J. Sci. Food Agric.*, 1953, **4**, 386-396. [Crop Res. Div., Dept. Sci. Indust. Res., Lincoln, N.Z.]

During 2 successive years ascorbic acid was estimated by indophenol titration in potato tubers of 20 varieties before, and at monthly intervals after, storage in a clamp of commercial type. The average ascorbic acid content of the 20 varieties fell from 16.0 to 10.0 mg. per 100 g. fresh tissue over about 8 months in 1949. The results for 1950 were similar and are presented for the same

varieties grown in 4 different places. Variety had a significant relation to ascorbic acid content. An increase in ascorbic acid content was found after prolonged storage when sprouting had commenced; the possible causes are discussed.—P. C. Jowsey.

539

SHILO, YU. M. and RAKHIMOVA, G. N. Soderzhanie vitamina C v moloche kobyly. [**The vitamin C content of mare's milk.**] *Konevodstvo*, 1953, No. 4, 39-43. [Kharkov Sovkhoz "Put' Industrialisatsii".]

The mean value for vitamin C in the milk of all the mares examined was 91 mg. per litre with individual variations from 34 to 147. The vitamin C content changed during lactation; it was low in the spring, at the beginning of lactation, increased in summer and then fell again in the autumn. These changes are most probably the result of variation in the amount of vitamin C in the diet during these periods. The vitamin C content was not much affected by work, breed, or age.

W. Hughes.

See also Absts. 167, 533.

OTHER VITAMINS

540

BENDER, A. E. and TUNNAH, E. J. **Vitamin T: growth and protein utilization in the rat.** *J. Sci. Food Agric.*, 1953, **4**, 331-333. [Crookes Laboratories, Ltd., Park Royal, London, N.W.10.]

Groups of young rats received a stock diet alone or supplemented with extra B vitamins or 1 mg. or 100 mg. per rat daily of dried medium from a 10-day culture of *Torula utilis* grown on a malt medium, to provide the so-called vitamin T complex.

Growth of groups on stock diet with or without extra B vitamins was similar. Addition of the vitamin T supplement had no effect on growth rate or utilisation of protein.

In a second experiment, adult rats were deprived of protein for 7 days and then given 0.12 or 0.24 g. N daily as wheat gluten or dogfish meal, alone or supplemented with 0.01 ml. or 0.25 ml. commercial vitamin T (Pharmazell, T Vitamin Goetsch). The vitamin T had no effect on the rate of repletion with vegetable or animal protein.

The claims of Goetsch (*Öst. zool. Ztschr.*, 1948, **1**, 533) and of Pototschnig (*Med. Klin.*, 1951, **46**, 987) that vitamin T accelerates growth and improves food utilisation and assimilation of proteins could not be substantiated.—V. R. Jackson.

541

MOCH, R. Versuche mit "T-Vitamin Goetsch" und Magermilch an dystrophischen Ferkeln.

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[**Experiments with T-Vitamin Goetsch and skimmed milk for dystrophic pigs.**] *Berl. Münch. tierärztl. Wochenschr.*, 1953, **66**, 248-250. [Physiol. Inst., Tierärztl. Hochsch., Hanover.] English summary.

Three unthrifty piglets aged 15 weeks and weighing only from 13 to 14 kg. were given a diet of oats, barley, potato flakes and fishmeal, with Vigantol and a mineral mixture. One received no supplement, one received 1 litre skimmed milk daily and the third had daily 2 g. Tevita, a preparation of vitamin T. The pig receiving vitamin T showed 53 per cent., and the one having skimmed milk showed 14 per cent., greater increase than the pig having no supplement. In a further test two pairs of piglets were given vitamin T or skimmed milk as a supplement and again those receiving vitamin T showed greater weight increase and better condition than the others.—A. M. Copping.

542

VOIT, K. and SECKFORT, H. Zur Stoffwechselwirkung des Inosit. [**Metabolic action of inositol.**] *Münch. med. Wochenschr.*, 1953, **95**, 680-681. [Med. Klin., Univ. Mainz.]

543

PETUELY, F. Der Bifidusfaktor, ein neuer vitamin-artiger Wirkstoff. [**Bifidus factor, a new vitamin-like substance.**] *Naturwissenschaften*, 1953, **40**, 349-352. [Med. Chem. Inst., Univ. Graz.]

4. PHYSIOLOGY OF NUTRITION

ENZYMES

544

- SLATER, E. C. **Biological oxidations.** *Annu. Rev. Biochem.*, 1953, **22**, 17-56. [Molteno Inst., Univ. Cambridge.]

545

- MUUS, J. **Studies on salivary amylase with special reference to the interaction with chloride ions.** *C.R. Lab. Carlsberg (Sér. chim.)*, 1951-53, **28**, 317-334. [Copenhagen.]

Crystalline amylase was prepared from human saliva and its solubility, stability and electrophoretic mobility were examined in the presence and absence of chloride or acetate. All the activities of the enzyme were enhanced in the presence of chloride ions, more than with acetate.

A. M. Copping.

546

- LOES, M. Vergleichende Untersuchungen über den enzymatischen Abbau der verschiedenen Stärkearten. [**Comparative studies on enzymic hydrolysis of different starches.**] *Ann. paediat.*, 1953, **181**, 1-16. [Kinderklin., Univ. Freiburg i. Br.] English and French summaries.

Before studying the digestibility of starches by pancreas amylase the method was investigated, since it seemed probable that discrepancies in reported results were caused by failure to maintain constant experimental conditions. The rate of hydrolysis of the starches was followed by Bertrand's reduction method and Krainick's iodine colour estimation. The enzymic hydrolysis of starches of potato, wheat, maize, rice, barley, rye and oats, with constant concentrations of enzyme and substrate, showed that potato starch was hydrolysed more rapidly and completely than any of the cereal starches, which were all hydrolysed at the same rate and to the same degree. The duration of boiling of the starch paste had no effect on the rate of hydrolysis.—M. B. Richards.

547

- JACKEL, S. S., SCHULTZ, A. S. and SCHAEDEER, W. E. **Susceptibility of the starch in fresh and stale bread to enzymatic digestion.** *Science*, 1953, **118**, 18-19. [Fleischmann Labs., Standard Brands, Inc., New York 51.]

Rate of digestion of bread crumb was measured by a modification of Jackel's method (*Cereal Chem.*, 1952, **29**, 190) in which α -amylase was replaced by pancreatin. For ordinary bread the rate fell steadily as storage time increased until after 160

hr. it was about 75 per cent. of that after 20 hr. When the bread had been baked with the addition of bacterial α -amylase there was no change in the rate of digestion after storage for up to 160 hr.

The reduction in the rate for control bread after storage is contrary to the earlier results of other workers (e.g., Abst. 3139, Vol. 13) and it is suggested that the difference may have arisen, not from a change in susceptibility of the starch to enzyme attack but, in those experiments where dispersion was not complete, to a change with age in its availability for enzymic digestion.

D. Harvey.

548

- JACKEL, S. S., SCHULTZ, A. S. and SCHAEDEER, W. E. **The *in vitro* digestibility of the starch in fresh and stale bread.** *Cereal Chem.*, 1953, **30**, 236-241. [Fleischmann Labs., Standard Brands, Inc., New York 51.]

See above Abst.

549

- LINDERSTRØM-LANG, K. and MØLLER, K. M. **Proteolytic enzymes.** *Annu. Rev. Biochem.*, 1953, **22**, 57-84. [Carlsberg Lab., Copenhagen.]

550

- ALMQUIST, H. J. and MERRITT, J. B. **Effect of crystalline trypsin on the raw soybean growth inhibitor.** *Proc. Soc. Exp. Biol. Med.*, 1953, **83**, 269. [Grange Co., Modesto, Calif.]

In view of the results of Borchers and Ackerson (Abst. 5244, Vol. 21) with rats, further experiments were made with chickens given rations containing 0.05 per cent. crystalline lyophilised trypsin. These confirmed earlier findings (Absts. 3141, 3142, Vol. 22) that the enzyme counteracts the growth inhibitor present in raw soya bean meal.

D. Harvey.

551

- PONTREMOLI, S. La tripsina quale generatore di fattori lipotropi. [**Trypsin as precursor of lipotropic substances.**] *Quad. Nutrizione*, 1952, **12**, 337-340. *Proc. [Ist. Fisiol. Umana, Univ. Genoa.]*

552

- ROMANO, E. and PENNETTI, V. Sull'azione lipotropa della tripsina. [**Lipotropic action of trypsin.**]

- PENNETTI, V. and ROMANO, E. Sull'attività lipotropa della tripsina in una steatosi colino-resistente. [**Lipotropic action of trypsin in**

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steatosis resistant to choline.] *Boll. Soc. ital. Biol. sper.*, 1952, **28**, 1830-1832; 1832-1834. [Ist. Chim. Biol., Univ. Naples.]

Of 20 rats, weighing from 150 to 200 g. and given subcutaneously on 2 successive days 0.75 mg. per 100 g. bodyweight of P dissolved in oil, 12 received a daily intraperitoneal injection of 65 mg. trypsin Merck on the same 2 days and one succeeding one; the others had no further treatment. All were killed on the fourth day. The percentage of fat in the fresh liver ranged from 5.76 to 9.06 in the animals given trypsin, and from 10.37 to 18.12 in those not given trypsin.

Sixteen rats were given a choline-free diet with 10 per cent. casein. After 3 weeks, for another week, all received 0.4 per cent. choline and 3 also received lipocaic, 6 received trypsin Merck and 2 received inositol, while 5 had no further addition. They were then killed. The fat percentage in the fresh liver ranged, in those given choline only, from 19.30 to 28.50. In the other 3 groups it did not differ significantly, ranging from 6.50 to 8.75. The failure of choline to protect against fatty liver on a low-protein diet was thus demonstrated.

E. M. Hume.

553

WILLIAMS, J. N. (Jr.) and SREENIVASAN, A. A study of the cofactors required by the tyrosine oxidase system of the liver.

Further studies on the cofactors of the liver tyrosine oxidase system.

The stability and activation of the liver tyrosine oxidase system. *J. Biol. Chem.*, 1953, **203**, 109-116; 605-612; 613-623. [Dept. Biochem., Coll. Agric., Univ. Wisconsin, Madison.]

The total tyrosine oxidase system of rat liver was completely extracted by 0.25 M sucrose solution. From experiments made with this extract at pH 7.4 and 37° C. in a Warburg apparatus, in which 2:6-dichlorophenolindophenol was used for the destruction of ascorbic acid, the involvement of ascorbic acid in the oxidation system previously reported by other workers (Absts. 1903, Vol. 20; 2102, Vol. 22; 2266, Vol. 23) has been confirmed. The evidence suggests that glutathione is also implicated, probably at a later stage in the system than ascorbic acid. Low concentrations of 2:6-dichlorophenolindophenol stimulated tyrosine oxidase; high concentrations totally inhibited it. Possible explanations of this finding are discussed.

Further experiments support the above findings; ascorbic acid stimulated the production of acetoacetate from homogentisic acid, but dichlorophenolindophenol inhibited this stage in the oxidation system. The addition of ascorbic acid, glutathione, low concentrations of dichlorophenolindophenol or extract of boiled fresh enzyme

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significantly stimulated the activity of enzyme aged by incubation alone at 37° C. for 1 hr. When these substances were added in different combinations the effects were additive and closely approached the sum of the effects of the individual substances. Thus it would appear that ascorbic acid functions in two places in the tyrosine oxidase system and that glutathione and a labile substance for which 2:6-dichlorophenolindophenol can be a substitute are additional components of the system.

When liver tyrosine oxidase was aged at 5° C. in a stoppered flask or dialysed against distilled water at 5° C. for increasing lengths of time the loss of activity was the same for 24 hr., but after this was greater in the dialysed system. Ascorbic acid increased the activity of both dialysed and aged enzyme preparations, but dichlorophenolindophenol increased only the latter. The activity of dialysed enzyme could be restored by a combination of ascorbic acid, glutathione and an extract of heated fresh enzyme. This latter extract contains a substance, anionic in nature, which is necessary for maximum tyrosine oxidation. The interrelationships of these substances for tyrosine oxidase are discussed and their possible sites of action in the oxidation of tyrosine to acetoacetate and fumarate are tentatively indicated.

W. Godden.

554

KLUG, H. L., MOXON, A. L., PETERSEN, D. F. and PAINTER, E. P. Inhibition of rat liver succinic dehydrogenase by selenium compounds. *J. Pharmacol. Exp. Therap.*, 1953, **108**, 437-441. [Chem. Dept., Exp. Stat., S. Dakota State Coll., Brookings.]

555

BEGG, R. W., DICKINSON, T. E. and WHITE, A. V. The influence of some hormonal, dietary, and tumor factors on liver catalase activity in rats. *Canad. J. Med. Sci.*, 1953, **31**, 307-314. [Dept. Med. Res., Univ. W. Ontario, London.]

There was no marked change in liver catalase activity associated with the disturbance of growth caused by reduction of dietary protein from 25 to 6 per cent.—D. Harvey.

556

BEINERT, H., BOCK, R. M., GOLDMAN, D. S., GREEN, D. E., MAHLER, H. R., MIT, S., STANSLY, P. G. and WAKIL, S. J. The reconstruction of the fatty acid oxidizing system of animal tissues. *J. Amer. Chem. Soc.*, 1953, **75**, 4111-4112. [Inst. Enzyme Res., Univ. Wisconsin, Madison.]

Published data on the enzymic oxidation of fatty acids to citrate are reviewed. All the steps of the reactions were shown to be reversible and

the enzymic synthesis of butyryl-coenzyme A from acetyl-coenzyme A was demonstrated; for this reaction a Cu flavoprotein, benzyl viologen and reduced diphosphopyridine nucleotide were necessary.—G. A. Garton.

557

RICHERT, D. A. and WESTERFELD, W. W. **The effect of diet on tissue choline oxidase.** *J. Biol. Chem.*, 1952, **199**, 829-833. [Dept. Biochem., Med. Coll., State Univ. New York, Syracuse.]

Adult rats maintained on dog chow showed normal liver and kidney choline oxidase activity. Weanling rats had about half this activity, but on a diet containing 21 per cent. casein, with riboflavin, vitamin B₁, pyridoxine, pantothenate, nicotinic acid and choline, adult levels were reached in 2 to 4 weeks. In the experiments described, weanling rats were fed on casein diets deficient in one of the vitamin constituents for 2 to 4 weeks.

A riboflavin-deficient diet gave low values for liver choline oxidase. Omitting choline from the diet decreased kidney and liver choline oxidase in the rats, which survived for 9 days. Diets deficient in vitamin B₁ or pyridoxine produced little change in the choline oxidase activity.

The reduction of dietary protein to 8 per cent. produced a 50 per cent. decrease in liver choline oxidase in both adult and weanling rats. Addition of 0.1 per cent. iodinated casein to the diet gave a consistent decrease in both liver and kidney choline oxidase.—A. Iggo.

558

KLUGA, L. P. **[D-Amino-acid oxidase in the blood of domestic animals.]** *Trudy Vses. Obsch. Fiziol., Biokhim., Farmakol.*, 1952, No. 1, 111.

559

VORHAUS, L. J. and KARK, R. M. **Serum cholinesterase in health and disease.** *Amer. J. Med.*, 1953, **14**, 707-719. [Dept. Med., Univ. Illinois Coll. Med., Chicago.]

A review with 96 references.

560

HEATH, D. F. and PARK, P. O. **An irreversible choline-esterase inhibitor in white clover.** *Nature*, 1953, **172**, 206. [Pest Control, Ltd., Harston, Cambridge.]

The inhibitor was extracted from white clover strain S100, untreated or treated with radio-active octamethylpyrophosphoramide.

The total inhibitor activity was estimated by the method of Michel (Abst. 1400, Vol. 20) and the results, expressed as the volume of solution in ml. extracted from 1 kg. clover which induced 50 per cent. inhibition in a serum solution after incuba-

tion for 30 min. at 25.6° C., were: untreated samples 32 to 4550, treated 2140 to 10,620. The considerable variation may be accounted for by adsorption on the chlorophyll, which was removed during processing, or by variation due to stage of growth.

The substance does not inhibit cholinesterase by producing cyanide, but it may be identical with one of the cyanogenetic compounds present in clover which are believed to cause bloat in sheep and cattle.—P. C. Jowsey.

561

DIXON, M. and WEBB, E. C. **Phosphate-transferring enzymes.** *Brit. Med. Bull.*, 1953, **9**, 110-115. [Dept. Enzyme Biochem., Univ. Cambridge.]

562

KING, E. J. **Plasma alkaline phosphatase in disease.** *Brit. Med. Bull.*, 1953, **9**, 160-164. [Postgrad. Med. Sch., London.]

563

IBER, F. L. **Serum alkaline phosphatase in the rat.** *Bull. Johns Hopkins Hosp.*, 1953, **93**, 54-56. *Proc.* [Med. Sch., Johns Hopkins Univ., Baltimore, Md.]

564

TUBA, J., SILUCH, K. A., ROBINSON, M. I. and MADSEN, N. B. **The relationship of dietary factors to rat serum alkaline phosphatase. 4. The effect of dietary oxalate.** *Canad. J. Med. Sci.*, 1952, **30**, 515-519. [Dept. Biochem., Univ. Alberta, Edmonton.]

Twenty-four growing rats in 4 groups were maintained on synthetic diets for 6 weeks. Diet 1 contained 0.5 per cent. Ca as lactate, which in diet 2 was replaced by sucrose containing 0.09 per cent. Ca. Diet 3 contained 0.5 per cent. Ca and dried rhubarb which provided 0.95 per cent. oxalate, and diet 4 contained 0.95 per cent. oxalate as the Na salt. Serum alkaline phosphatase, serum P, Ca and Mg and the ash content of the tibia were estimated.

A low-Ca diet with or without oxalate produced increases in serum alkaline phosphatase, and serum P and Mg and ash content of tibia indicated that the animals were rachitic. This was confirmed by staining the tibiae with silver nitrate and examining the epiphyseal plate.—A. Iggo.

565

TUBA, J. and ROBINSON, M. I. **The response of intestinal alkaline phosphatase of fasted rats to forced feeding of fat.** *J. Biol. Chem.*, 1953, **203**, 947-951. [Dept. Biochem., Univ. Alberta, Edmonton.]

Adult male rats were fasted for 2, 6 or 12 days and then received 1 ml. olive oil or 1 ml. water by mouth. They were killed after 8 hr. and alkaline phosphatase was estimated in the blood serum and in the first 10 cm. of the intestine from the pylorus. After 2 days' fast both serum and intestinal phosphatase had fallen sharply and they continued at a low level for the longest periods of fasting. After olive oil serum alkaline phosphatase was elevated at all stages of fasting, but the response was smaller as fasting was prolonged. After 2 days' fasting, intestinal phosphatase was much increased after ingestion of olive oil, but not after 6 or 12 days' fast. N in both liver and intestine fell steadily as fasting continued.

W. Godden.

566

MATTENHEIMER, H. Die Dephosphorylierung von Casein und Phosphopepton durch Phosphoprotein-Phosphatase. [The dephosphorylation of casein and phosphopeptone by phosphoprotein phosphatase.] *Hoppe-Seyler's Ztschr.*, 1953, **292**, 276-286. [Physiol. Chem. Inst., Freie Univ. Berlin.]

In a series of experiments designed to investigate more closely the differences between phosphoprotein phosphatase and phosphomonoesterase, it was shown that phosphopeptone, casein, α -casein and β -glycerophosphate could be dephosphorylated by enzyme solutions prepared from pig's stomach, rat's liver, and human prostate and ejaculate. That phosphomonoesterase and phosphoprotein phosphatase are not identical enzymes was shown

by the selective inactivation of phosphomonoesterase by incubation with alkali and the quantitative separation of the 2 enzymes, by means of electrodialysis, in an extract of the mucous membrane of sow's stomach. β -Glycerophosphate was not hydrolysed by phosphoprotein phosphatase; on the other hand, there were indications of a partial dephosphorylation of phosphopeptone and α -casein by phosphomonoesterase. Stomach cathepsin showed no phosphatase activity with the substrates used. The enzymatic dephosphorylation of phosphopeptone and casein was scarcely affected by simultaneous catheptic breakdown of the substrates.

M. B. Richards.

567

COBB, J. D. Relation of glycogen, phosphorylase, and ground substance to calcification of bone. *Arch. Pathol.*, 1953, **55**, 496-502. [Dept. Pathol., Univ. Illinois Coll. Med., Chicago.]

The tibiae of normal rats from birth to 45 days of age and of rachitic rats from 42 to 56 days were sectioned without decalcification. Sections were stained for glycogen and glycoproteins or used to show the presence of phosphorylase.

Matrix which had just formed or was just about to be mineralised stained intensely, but that of mature bone did not. Those cells which were apparently most active in matrix formation contained least glycogen and most phosphorylase activity.

Rachitic osteoid stained intensely by the Hotchkiss method.—R. Hill.

See also Absts. 361, 404, 491, 525, 856, 857.

DIGESTION AND ABSORPTION

568

BENJAMIN, H. B., WAGNER, M. and ZEIT, W. Intra gastric temperature; its variations in gastric ulcers. *Surg. Gynecol. Obstet.*, 1953, **97**, 19-24. [Dept. Anat., Sch. Med., Marquette Univ., Milwaukee, Wis.]

In 8 normal men intra gastric temperature was about 1° to 3° F. less than oral temperature and dropped sharply about half an hour after the subject expressed a desire for food. The results obtained in 4 patients with gastric ulcer are described in detail. In these also a drop associated with hunger pangs was noted. It is stated that temperatures were recorded from numerous other ulcer patients. The temperature variations were apparently related to the degree of activity of the ulcer.—F. C. Aitken.

569

SCHLÜSSEL, H., VARLIK, A. and ÖZSOY, I. S. Über die Resorption und Verwertung einiger Nähr-

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unseiweiße beim Menschen, zugleich ein Beitrag zur klinischen Resorptionskontrolle. [Absorption and relative value of certain proteins for human beings, with a contribution to the clinical study of absorption.] *Klin. Wochenschr.*, 1953, **31**, 508-509. [Med. Klin., Univ. Cologne.]

Healthy human subjects were given rabbit flesh, torula yeast or buckwheat, prepared to contain protein marked with ^{35}S by giving the organisms labelled food. For comparison of the rate of absorption other subjects were given yeast hydrolysate containing ^{35}S . Radioactive S was estimated in the urine; with all the materials excretion reached a maximum about 3 hr. after administration. There was a further temporary rise after a meal.—E. M. Hume.

570

LUKSHIN, V. V. Izmenenie sekretornoj funktsii zheludka lozhadi pod vliyaniem kachestvenno

razlichnykh ratsionov kormleniya. [Changes in the secretory function of the stomach of horses as a result of qualitative differences in the rations.] *Konevodstvo*, 1953, No. 4, 31-38.

The effect of 3 diets, hay and oats, "Kombi korm", or pasturage, on the secretory functions of the stomach of horses was studied by analysing the stomach contents, blood and urine.

In general the experiments showed that the function of the digestive organs depends on the properties of the diet. A constant diet leads to adaptation in quantity and composition of digestive juices. When the horses were maintained on hay and oats for a long time, reduced acid secretion in the stomach led to functional and organic disorders.—W. Hughes.

571

PARTHASARATHY, D. and PHILLIPSON, A. T. **The movement of potassium, sodium, chloride and water across the rumen epithelium of sheep.** *J. Physiol.*, 1953, **121**, 452-469. [Rowett Res. Inst., Bucksburn, Aberdeenshire.]

Studies on the absorption of Na, K, chloride and water from the rumen of sheep supported the evidence that rumen epithelium is a selective membrane. The venous - arterial differences between rumen and carotid blood for K, Na and Cl proved a reliable indication of whether significant absorption was occurring. No absorption of Na and K took place until their concentrations in the rumen exceeded those of carotid blood. Chloride was absorbed from the rumen against a concentration gradient if the concentration was 135 mg. per 100 ml. or more, but chloride in the rumen increased when concentrations of less than 100 mg. per 100 ml. were present. No relation was found between the absorption of acetate or propionate and the presence or absence of K. The absorption of fatty acids was influenced only by reduction of pH or introduction of 0.002 M mercuric chloride, which decreased the absorption of chloride, water and fatty acid, but did not affect that of Na and K. The experiments showed that rumen epithelium is readily permeable to water. Absorption of water occurred from solutions of 0.165 M concentration or less, but the volume of solutions of 0.33 M increased when they were introduced into the rumen.—M. B. Richards.

572

BRUNAUD, M. and DUSSARDIER, M. **Études sur la motricité des estomacs des ruminants. 2. Feuillet et caillette. [Studies of the motility of the stomachs of ruminants. 2. Omasum and abomasum.]** *Rec. Méd. vét.*, 1953, **129**, 273-286. [Lab. Physiol., École Nat. Vét., Toulouse.]

For part 1 see Title 4458, Vol. 23.

573

CLARK, C. H. **The nerve control of rumination and reticulo-ruminal motility.** *Amer. J. Vet. Res.*, 1953, **14**, 376-384. [Dept. Vet. Physiol. Pharmacol., Coll. Vet. Med., Ohio State Univ., Columbus.]

Section of one cervical vagal trunk in a sheep caused a slight decrease in the speed of contraction of the reticulum and the dorsal sac of the rumen. In 6 decerebrate sheep no spontaneous movement of the reticulum was seen; but spontaneous swallowing movements occurred. Decorticated sheep lived up to a year and the most noticeable manifestation was blindness; movements of the reticulum and rumen and the time daily spent in eating and ruminating were normal. Frontal lobectomy was performed in 2 sheep, and in these animals, which lived 63 days and 6 months, the time spent in ruminating was doubled, but the time spent in eating and the quantity of food eaten were normal. Destruction of areas at the base of the brain oral to the anterior commissure and ventral to the genu of the corpus callosum by local injections of methanol increased the length of the time spent in ruminating. One animal ruminated continuously for 24 hr. and in another the co-ordination between regurgitation and reticulum contractions was lost. Damage to the left hypothalamic nuclei was found in the latter. It is suggested that an area of the subcortical tissue anterior to the stalk of the pituitary is intimately connected with rumination and movements of the reticulo-rumen sacs.—A. T. Phillipson.

574

WILLIAMS, V. J., NOTTLE, M. C., MOIR, R. J. and UNDERWOOD, E. J. **Ruminal flora studies in the sheep. 4. The influence of varying dietary levels of protein and starch upon digestibility, nitrogen retention, and the free micro-organisms of the rumen.** *Austral. J. Biol. Sci.*, 1953, **6**, 142-151. [Inst. Agric., Univ. W. Australia, Nedlands.]

For previous papers see Absts. 624, Vol. 20; 809, Vol. 21; 5216, Vol. 21.

Nine diets were designed to give no starch or 99 or 149 g. daily, and about 14, 60 or 80 g. protein daily. Twelve sheep from 2 to 2½ years old were used.

Starch depressed the numbers of free bacteria present in the rumen liquor on the low-N diets; this effect was less, and not statistically significant, on intermediate-N rations, and was abolished at the high-N level. Increasing the protein of the ration did not increase the bacterial counts when no starch was given, but produced a significant rise in rations containing starch.

The addition of starch at all levels of protein feeding brought about little difference in the

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digestibility of dry matter, but at all levels of starch feeding protein significantly increased dry matter digestion.

It is concluded that the proportion of the total protein in the ration converted to bacterial protein, on the assumption that this is reflected by the bacterial counts, is not a constant, but diminishes as the intake of protein increases, for bacterial counts increased from 27 to 58 millions per c.mm. while protein intakes increased by a wider ratio, from 14.2 to 82.3 g. daily.—A. T. Phillipson.

575

VAN LIERE, E. J., FANG, H. S. and NORTHUP, D. W. **Effect of semi-starvation on propulsive motility of the small intestine.** *Proc. Soc. Exp. Biol. Med.*, 1953, **83**, 98. [Dept. Physiol., Sch. Med., W. Virginia Univ., Morgantown.]

Twelve rats were underfed until they had lost on the average 39 per cent. of their weight. They were then paired with control rats and after 12 hours' starvation were given 2 ml. of a mixture of 10 per cent. powdered charcoal suspended in a 10 per cent. solution of gum acacia. The charcoal traversed 72 per cent. of the gut in the controls and 91 per cent. in the semi-starved rats.

A. T. Phillipson.

576

GIL', S. A. O vliyanii raznovidnostei kislogo vosstanovlennogo moloka na sekretornuyu, motornuyu i vsasyvatel'nuyu funktsii tonkikh kishok. [**Effect of different kinds of sour milk made from powder on secretory, motor, and absorptive function of the small intestine.**] *Vop. Pediat.*, 1952, **20**, No. 6, 32-38. [Khar'kov Nauch-Issled. Inst. Okhran. Mater i Detstva.]

Kefir prepared from whole condensed milk tends to pass through the stomach and small intestine more evenly and slowly than milk acidified with lactic acid. When dogs were fed on kefir, less chyme appeared from intestinal fistulae during the whole of the digestion period than when whole milk acidified with lactic acid was used. When puppies were fed on kefir the chyme moved more rapidly along the digestive tract than in young dogs; there was very little difference between the rate of flow of chyme in puppies and young dogs when acid milk was used. Protein, fat and minerals were absorbed more rapidly from the small intestine when kefir was used. Carbohydrates were absorbed well from both types of milk, the uptake being greater in young dogs than in puppies.—W. Hughes.

577

BRAKSH, T. A. Ob usvoenii pishchi pri dlitel'nom medikamentoznom sne. [**Assimilation of food in prolonged sleep therapy.**] *Klin. Med.*,

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Mosk., 1952, **30**, 85-86. [Lab. Otdel. Fiziol., Inst. Pit., Akad. Med. Nauk SSSR.]

White rats fed on casein, starch, fat, salt mixture, dry yeast and fish oil were anaesthetised with sodium amytal, a subcutaneous injection of 250 mg. per kg. bodyweight twice a day. They were kept asleep for 10 days. No difference could be detected in the digestibility of fat, protein, and carbohydrate before, during or after sleep. There was very little difference in digestibility of food given to animals suffering with ulcers before, during and after the sleep treatment in which chloral hydrate, sodium amytal and luminal were used as narcotics. A slight decrease in digestibility of fat occurred towards the end of sleep.

W. Hughes.

578

SCHLÜSSEL, H. and SUNDER-PLESSMANN, L. Zur Lokalisation der Eiweissresorption im Magen-Darmtrakt. Tierexperimentelle Untersuchungen mit S³⁵-markiertem Hefeeiweiss. [**Location of protein absorption in the gastro-intestinal tract. Animal experiments with yeast protein labelled with ³⁵S.**] *Klin. Wochenschr.*, 1953, **31**, 545-547. [Med. Klin., Univ. Cologne.]

It had previously been shown that radio-active S introduced into living *Torula utilis* was present only in the sulphur amino-acids (Absts. 2472, Vol. 21; 1016, Vol. 22). Such radio-active yeast was prepared in 34 portions, each containing 50 μ C. of activity, which were administered to 34 female rats of weight from 70 to 100 g., which had fasted for 12 hr. After 2, 4, 6, 8 or 10 hr. the animals were bled under ether anaesthesia and killed. The liver and gastro-intestinal tract were removed and washed. The small intestine was divided into 4, and the colon into 2, portions of the same length. The tissues were dried and ³⁵S was estimated in them. The mean results for 6 or 7 rats are expressed as percentages of the total dose.

The peak of absorption was reached in the duodenum and in all parts of the small intestine and colon at the same time. For the whole tract the time of maximum absorption ranged from 2 to 7 hr. after administration, with the activity decreasing in both directions from the duodenum to the rectum and to the stomach. Most of the absorption was from the small intestine.

E. M. Hume.

579

AGAR, W. T., HIRD, F. J. R. and SIDHU, G. S. **The active absorption of amino-acids by the intestine.** *J. Physiol.*, 1953, **121**, 255-263. [Dept. Physiol., Univ. Melbourne, Victoria.]

A loop of about 40 cm. of rat small intestine was mounted in a modified Fisher and Parsons apparatus (Abst. 4446, Vol. 19) and a glucose-bicarbonate

solution gassed with 5 per cent. CO₂ in O₂ was circulated inside and outside the loop. Amino-acids or peptides were added to the inner fluid or to both fluids and after 1 or 2 hr. the fluids were measured and analysed.

L-Histidine and L-phenylalanine were removed from the lumen faster than water and against the concentration gradient. D-Histidine, L-glutamic acid and D-phenylalanine were transferred at the same rate as, or more slowly than, water. There were net losses of L-phenylalanine and L-histidine during the first 15 min., and a small net gain of L-glutamic acid; the histidine could be recovered from the gut wall, and it was assumed that these amino-acids had to saturate the cells before appearing in the outer fluid. In the presence of cyanide or dinitrophenol, L-histidine was transferred at the same rate as water.

Glycyl- and leucylglycine were partly transferred as such, but were mostly hydrolysed in the inner fluid and the amino-acids were transferred. Glycylglycylglycine was not transferred but hydrolysed, glycine and small amounts of glycylglycine appearing in the outer fluid.—C. Warner.

580

BERGSTRÖM, S. and BORGSTRÖM, B. **Some new aspects of the intestinal absorption of fats.** *Acta Soc. Med. upsalien.*, 1953, **58**, 331-341. [Dept. Physiol. Chem., Univ. Lund., Sweden.] A review.

581

BERNHARD, K. and RITZEL, G. Galle und Fettresorption. [Bile and fat absorption.] *Helv. physiol. pharm. Acta*, 1953, **11**, 166-170. [Physiol. Chem. Inst., Univ. Basle.] English summary.

In experiments with labelled fat on rats with gall-bladder and thoracic duct fistulae, both faeces and lymph gave lipids with greatly reduced deuterium content. In animals with thoracic duct fistulae only, and normal flow of bile into the intestine, the deuterium content of the lymph lipids was little altered. The results show that fat is absorbed by rats even in the absence of bile, and confirm previous findings on man and dog that in the absence of bile endogenous fat is secreted into the intestine, with dilution of the food fats. An important, but hitherto unknown, function of bile in fat absorption is the prevention of this secretion of endogenous fat into the intestine.—M. B. Richards.

582

DE LANGEN, C. D. **Steatorrhoea and the intestinal circulation.** *Doc. Med. geograph. trop.*, 1953, **5**, 157-167. [Dept. Internal Dis., Univ. Hosp., Utrecht.]

Idiopathic steatorrhoea is considered to be a result of faulty absorption, which can be brought about, as has been shown in animal experiments, by any condition which affects the circulation. The mechanism of absorption is discussed in detail; it is considered to be a biphasic process comparable with secretion in the kidneys. Conditions affecting intestinal circulation and absorption are reviewed.—L. Wills.

583

REISER, R. and WILLIAMS, M. C. **Dihydroxyacetone esters as precursors of triglycerides during intestinal absorption.** *J. Biol. Chem.*, 1953, **202**, 815-819. [Dept. Biochem. Nutrit., Texas Agric. Exp. Stat., College Station.]

Rats were fed on monopalmitin and 1-palmitoxy-3-hydroxyacetone, each labelled with ¹⁴C in the carboxyl group of the palmitic acid and in carbon 3 of the alcohols. Thoracic duct lymph was collected.

Monopalmitin was hydrolysed in the intestine to the extent of 73 per cent. and appeared in the thoracic duct lymph in the form of triglycerides. Palmitoxyhydroxyacetone was hydrolysed to about the same degree in the intestine; triglycerides appeared in the lymph, indicating that reduction and esterification had taken place. It is suggested that esterification of dihydroxyacetone with subsequent reduction and esterification may be the normal path of triglyceride synthesis during fat absorption.—G. A. Garton.

584

DANIEL, J. W., FRAZER, A. C., FRENCH, J. M. and SAMMONS, H. G. **The intestinal absorption of liquid paraffin in the rat.** *Biochem. J.*, 1953, **54**, xxxvii-xxxviii. [Dept. Pharmacol., Univ. Birmingham.]

585

HERNANDEZ, H. H., PETERSON, D. W., CHAIKOFF, I. L. and DAUBEN, W. G. **Absorption of cholesterol-4-C¹⁴ in rats fed mixed soybean sterols and β -sitosterol.** *Proc. Soc. Exp. Biol. Med.*, 1953, **83**, 498-499. [Dept. Physiol., Sch. Med., Univ. California.]

Rats of Long Evans strain, fitted with thoracic duct cannulae, were fed on diets containing cottonseed oil and β -sitosterol or soya bean sterols, with or without simultaneous administration by stomach tube of ¹⁴C-labelled cholesterol. The percentage of ¹⁴C activity recovered from the lymph was estimated periodically over 48 hr. and the amount of ¹⁴C-labelled cholesterol ester in the lymph was calculated.

Simultaneous feeding of soya bean sterols or sitosterol with labelled cholesterol occasioned a marked reduction in ¹⁴C recoveries from thoracic

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duct lymph and in the proportion of esterified cholesterol in the lymph. When the diet contained only cottonseed oil and labelled cholesterol, about 50 per cent. of the lymph cholesterol was esterified.—G. A. Garton.

586

FOURNIER, P. and DUPUIS, Y. (with BOURDEAU, A.) Une méthode d'évaluation indirecte du taux de l'absorption des composés phosphorés à différents niveaux du tube digestif. [An indirect method of estimating the absorption of phosphorus compounds from different parts of the digestive tract.] Le sort des composés phosphorés de la ration dans les diverses parties du tube digestif du rat adulte. [The fate of phosphorus compounds in the ration in different parts of the digestive tract of the adult rat.] *J. Physiol., Paris*, 1953, **45**, 443–449; 451–461. [Lab. Physiol. Nutrit., École Hautes-Études, Paris.]

Adult male rats were divided into 3 groups of 3. The 3 diets used differed only in the amounts of titanium oxide added, at the expense of wheat flour, at 0.3, 1.0 and 3.0 per cent., respectively. Each diet contained approximately 240 mg. P per 100 g. The rats were killed after 2 weeks and coefficients of absorption of P were estimated for different segments of the digestive tract. The

concentration of TiO_2 did not affect the coefficient of P absorption, which was small in the stomach, negative in the first 3/4 of the small intestine and remarkably constant, at about 53, in the remainder of the digestive tract. The rate of transit of TiO_2 was similar to that of P, and TiO_2 is considered to be a useful marker for studies of P absorption in the rat.

Adult male rats, in 2 groups of 4, received diets differing only in P content; the first contained 245, the second 18 mg. P per 100 g. Each rat received 18 g. food daily. Rats were killed when the P : TiO_2 ratio in the faeces had been constant for several days. Changes in P concentration in different parts of the digestive tract were estimated from the changing P : TiO_2 ratio. The great increase in P concentration in the upper part of the small intestine is due to endogenous P, the output of this being estimated by difference between the concentrations observed on the medium- and low-P diets. The coefficient of P absorption is quite constant in the caecum, large intestine and faeces and the stability of the P : TiO_2 ratio indicates that there is no P absorption below the small intestine. Absorption occurs in the stomach and all along the small intestine. Endogenous P represents about 30 per cent. of the total P excreted in the faeces.—D. Duncan.

See also Absts. 150, 756, 1238.

COMPOSITION OF BODY FLUIDS AND TISSUES

BLOOD

587

BANERJI, B. Haematological studies in newborn infants. *J. Indian Med. Assoc.*, 1953, **22**, 355–359. [Howrah.]

Samples of blood were collected from the cord and heel of newborn infants born at term of mothers showing no signs of disease. The mean values with their standard deviations and, in brackets, the numbers of samples to which they refer were: Hb, cord (26) 14.43 ± 2.190 , heel (23) 15.52 ± 0.864 g. per 100 ml.; red cell count, cord (26) 5.43 ± 0.797 , heel (23) 6.52 ± 0.219 millions per c.mm.; reticulocyte count, cord (21) 0.88 ± 0.365 , heel (15) 1.42 ± 0.332 per cent.

The icteric index was higher at birth than between 2 and 7 days of age.—D. Harvey.

588

DAVIS, H. A. and ISENBERG, L. An improved blood volume method (Evans Blue dye) utilizable even in the presence of hemolysis and/or lipemia. *J. Lab. Clin. Med.*, 1953, **41**, 789–795. [Los Angeles County Hosp., Calif.]

Results obtained from 30 men and 19 women are recorded.—H. G. Bray.

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589

KARVONEN, M. J. and KUNNAS, M. Changes in red and white blood cells in association with competitive lumber work. *Sport Med.*, 1953, 110–115. [Inst. Occupat. Health, Helsinki.]

The conditions of work and collection of blood samples are described in Abst. 1782, Vol. 23. The changes in erythrocyte and Hb values are also given there. Eosinophils and lymphocytes fell significantly during work and rose during recovery, but segmented neutrophils rose during work and fell during recovery. The significance of the changes and their intercorrelations are discussed.—D. Duncan.

590

WALKER, J. and TURNBULL, E. P. N. Haemoglobin and red cells in the human foetus and their relation to the oxygen content of the blood in the vessels of the umbilical cord. *Lancet*, 1953, **265**, 312–318. [Midwifery Dept., Univ. Aberdeen.]

591

MURTY, V. N. and KEHAR, N. D. Physiological studies on the blood of domestic animals 3.

The normal blood picture of the Kumaoni bullock. *Indian J. Vet. Sci.*, 1952, **22**, 251-255. [Animal Nutrit. Div., Indian Vet. Res. Inst., Izatnagar.]

The average values and standard errors found in a study of 24 healthy adult Kumaoni bullocks maintained on a standard basal ration of rape cake and wheat bhoosa were: Hb 7.4 ± 0.18 per cent., red cell count $6.5 \pm 0.24 \times 10^6$ per c.mm., white cell count $8.4 \pm 0.33 \times 10^3$ per c.mm., cell volume 35.3 ± 1.34 per cent., mean corpuscular volume 54.6 ± 1.17 μ , mean corpuscular Hb 11.6 ± 0.29 μ g., mean corpuscular Hb concentration 21.2 ± 0.40 per cent., total reducing sugars 88.1 ± 2.06 mg. per 100 ml. blood, serum protein 6.79 ± 0.25 g. per 100 ml. serum. All the following are in mg. per 100 ml. serum: Ca 10.5 ± 0.10 , inorganic P 6.8 ± 0.20 , Mg 2.35 ± 0.11 , Na 369 ± 15.24 , K 14.0 ± 0.28 , Cl 385 ± 4.42 .

The data are compared with those for Hariana and Dhanni bullocks in some instances. [The figures in Table 2 are wrong in several places.]

P. C. Jowsey.

592

REYNOLDS, M. **Plasma and blood volume in the cow using the T-1824 hematocrit method.** *Amer. J. Physiol.*, 1953, **173**, 421-427. [Dept. Physiol., Sch. Vet. Med., Univ. Pennsylvania, Philadelphia.]

Plasma and blood volumes were found to be relatively less in cattle than those found in rats, rabbits, dogs, sheep and man with the same method. Plasma volumes of about 38 mg. per kg., corrected haematocrit values of 29 to 32 per cent. and blood volumes of 52 to 57 ml. per kg. are recorded.—H. G. Bray.

593

MUKHERJEE, D. P. and BHATTACHARYA, P. **Seasonal variation in haemoglobin and cell-volume contents in rams and goats.** *Indian J. Vet. Sci.*, 1952, **22**, 191-197. [Animal Genetics Sect., Indian Vet. Res. Inst., Izatnagar.]

Blood samples were collected at fortnightly intervals for 12 months from 9 rams and 8 goats. Summer conditions of high air temperature and high relative humidity and rainfall caused a reduction of Hb and cell volume. In spring, when air temperatures were moderate and relative humidity was low, this was reversed.

The trends were similar to those found by other authors for the seasonal variations in sperm quality of rams and goats.—P. C. Jowsey.

594

WATSON, D. F. **Studies on the hemoglobin content of sheep blood in the Sierra of Peru.** *Amer.*

J. Vet. Res., 1953, **14**, 405-407. [Pachacayo, Peru.]

Hb was estimated in healthy animals at altitudes of between 12,000 and 15,000 ft. in the Andes. The following average values, in g. per 100 ml., were obtained over 10 months: yearling ewes 15.85, yearling wethers 15.62, 2-year-old wethers 16.52. Changes in Hb level occurred during and after pregnancy and during illness and recovery from disease. Sheep imported from areas at or near sea level generally had initial Hb levels between 8.0 and 10.0 g. per 100 ml. and over 3 to 4 months there was a steady rise to levels similar to those quoted.—P. C. Jowsey.

595

IMMERTREU, W. **Die Hämatologie der Ratte. [The haematology of the rat.]** *Berl. Münch. tierärztl. Wochenschr.*, 1953, **66**, 191-192. [Königsdorf.] English summary.

596

SQUIBB, R. L., GUZMÁN, M., AGUIRRE, F. and SCRIMSHAW, N. S. **Ten constituents of the blood stream of well-fed white rats, chickens, swine, sheep, and horses in Guatemala.** *Amer. J. Vet. Res.*, 1953, **14**, 484-486. [Guatemala City.]

Total protein, riboflavin, ascorbic acid, carotenoids, tocopherols, alkaline phosphatase and vitamin A were estimated in serum, and Hb, haematocrit and red cell count in whole blood of white rats, New Hampshire Red chicks and hens, Duroc Jersey swine, native "criollo" sheep and horses. The results are presented in detail.

P. C. Jowsey.

597

BÉNARD, H., DANTCHEV, D. and GAJDOS, A. **Étude des proportions de deux variétés d'hémoglobuline au cours de la réparation de certaines anémies expérimentales chez le lapin. [Study on the proportions of two kinds of haemoglobin during recovery from experimental anaemia in the rabbit.]** *C.R. Soc. Biol.*, 1953, **147**, 601-602. [Clin. Méd., Hôtel-Dieu.]

Intense anaemia, from which spontaneous recovery occurred in about a fortnight, was produced in rabbits by bleeding on 3 successive days or by injection of phenylhydrazine. In some rabbits recovery was accelerated by administration of folic acid or of vitamin B₁₂.

In normal rabbits the proportion of alkali-resistant Hb varies between individuals but is constant in each rabbit. The proportion was unchanged during the development of anaemia, but during the replacement of corpuscles only alkali-resistant Hb was produced. The non-resistant type remained at its lowest level until

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the cell count was again normal. It is suggested that when necessary the more rapidly formed alkali-resistant Hb takes precedence in formation.

D. Duncan.

598

MAYER, J. **Glucostatic mechanism of regulation of food intake.** *New Engl. J. Med.*, 1953, **249**, 13-16. [Dept. Nutrit., Harvard Sch. Pub. Health, Boston.]

A review.

599

PALOMINO G., Y. Determinación de piruvicemia en estados normal y patológico. [Estimation of blood pyruvic acid in normal and pathological states.] *An. Fac. Farm. Bioquím.*, Lima, 1951, **2**, 599-609. [Lab. Clín., Hosp. 2 de Mayo, Lima.]

Blood pyruvic acid was estimated by Johnson's method in 15 healthy subjects and in 36 patients with different disorders. In the healthy subjects the values ranged from 0.87 to 2.09 mg. per 100 ml., mean 1.46 mg. For 18 patients with infections the values were 2.08 to 4.06 mg. per 100 ml., mean 2.13 mg.; for 6 with disorders of the circulation 2.64 to 4.06, mean 3.17 mg.; for 6 with disorders of the respiratory system 1.75 to 2.96, mean 2.31; and for 6 with renal disorders 1.79 to 2.86, mean 2.44 mg. The coefficients of variation in the groups were, respectively, 20.5, 46.2, 11, 19 and 7.7 per cent.—M. B. Richards.

600

STRÄSSLE, R. Fortschritte in der Isolierung und Untersuchung der Blutproteine. [Advances in isolation of and research on blood proteins.] *Experientia*, 1953, **9**, 242-252. [Wiss. Lab., Hoffmann La Roche and Co., Basle.] English summary.

601

KARTE, H. Elektrophorese der Blutserumproteine im Säuglingsalter. [Electrophoretic study of the blood serum protein in infants.] *Ztschr. Kinderheilk.*, 1953, **73**, 467-486. [Kinderklin., Univ. Göttingen.]

Data from 500 electrophoretic serum analyses and total protein estimations on 280 infants undergoing clinical treatment, and from over 40 serum investigations on healthy infants and newborn babies, provided for discussion of serum protein changes in the disorders of infancy. One of the most striking findings was the occurrence in infants of low blood protein values due to decrease of globulins, especially γ -globulin. The exudation of large amounts of blood plasma into inflamed tissue gave rise to low blood protein values, especially in young infants. Healthy infants had higher α -globulin and lower γ -globulin values than

children and adults. This difference was accentuated in the presence of inflammatory conditions, which led frequently to an increase of α -globulin and a decrease of γ -globulin.—M. B. Richards.

602

PASSARO, G. L'equilibrio elettrolitico nel lattante affetto da distrofia da carboidrati. [Electrolytic equilibrium in the infant with carbohydrate dystrophy.] Il volume del liquido extracellulare nel lattante affetto da distrofia da carboidrati. [The volume of extracellular fluid in the infant with carbohydrate dystrophy.] Il volume del liquido extracellulare nel lattante distrofico. [The volume of extracellular fluid in the dystrophic infant.] *Boll. Soc. ital. Biol. sper.*, 1953, **29**, 245-248; 248-251; 251-253. [Ist. Clin. Pediat., Univ. Rome.]

The proteins and electrolytes of the plasma, except Mg, were estimated in 9 children aged from 12 to 24 months who had been fed for some months previously on a diet almost exclusively of carbohydrate and fat. They were underweight, with oedema and signs of multiple vitamin deficiency. The protein values were low in all except one child. The values for all the electrolytes were low, so that the osmotic pressure of the plasma was low, but the alkali reserve was normal. After recovery the values had returned to normal.

Extracellular fluid was estimated with Na thiocyanate in 9 children from 11 to 27 months old with carbohydrate dystrophy and similar to those just described. The value taken as normal was 26 per cent. of the bodyweight. The values found before treatment ranged from 27.2 to 41.5. On treatment they slowly fell towards normal.

The same tests were made on premature infants aged from 1 to 3½ months, and the values found for extracellular fluid ranged from 34.3 to 44.9 per cent., being near to those for normal full-term infants at birth; they gradually fell with lapse of time.

For 30 infants aged from 3 to 39½ months, suffering from general undernutrition, the values for extracellular fluid ranged from 23.6 to 39.5 per cent. They were directly related to the severity of the undernutrition and came down on treatment, but less readily than in children with carbohydrate dystrophy.—E. M. Hume.

603

TARANOV, M. T. [Nitrogenous substances in the blood serum of horses of different ages.] *Konevodstvo*, 1953, No. 4, 28.

604

ANTONINI, F. M. and PIVA, C. Miglioramenti alla tecnica di elettroforesi su carta. [Improvements in the technique of electrophoresis on

paper.] Il frazionamento elettroforettico del siero di alcuni animali. [Electrophoretic fractionation of the serum of certain animals.] *Boll. Soc. ital. Biol. sper.*, 1952, **28**, 1885-1886; 1887-1889. [Clin. Med., Univ. Florence.]

Modifications of manipulation are described in detail. Amidochwarz 10B Bayer or Naphthalene Black I.C.I. is preferred to bromophenol blue for colouring the strips of paper.

With the method described, the serum of young healthy animals was examined. For the monkey (*Rhesus macaca mulatta*), horse, calf, pig, dog, cat, rabbit, guineapig, white rat, mouse, fowl and edible frog electrophoretic diagrams are given, and values are set out for total protein, albumin: globulin ratio and protein fractions numbered from 1 to 6 in order of decreasing mobility. Human serum was used for comparison.

E. M. Hume.

605

GLEASON, T. L. and FRIEDBERG, F. **Filter-paper electrophoresis of serum proteins from small animals.** *Physiol. Zool.*, 1953, **26**, 95-100. [Dept. Biol., Catholic Univ. America, Washington, D.C.]

Electrophoresis of blood serum proteins on paper strips showed the presence of 5 components in the serum of opossum, rat and mouse. In rats infected with *Trichinella spiralis* and in mice with mammary carcinoma there was a decrease of the albumin component. Serum from turtle and mud puppy showed 7, from frog 10, and from salamander 3 components; the total protein content was less and the rate of migration of the proteins was slower than in mammalian serum.

A. M. Copping.

606

CASANOVA CH., J. Determinación cuantitativa directa de colesterolemia total siguiendo la técnica de Sols. [Direct quantitative estimation of total cholesterol in blood by the method of Sols.] *An. Fac. Farm. Bioquim.*, Lima, 1951, **2**, 487-497. [Lab. Clin., Hosp. 2 de Mayo, Lima.]

The technique of Sols (Abst. 75, Vol. 18) was used for the first time in Peru to estimate total cholesterol in blood. In 12 healthy subjects the blood cholesterol lay between 129 and 181, with a mean of 157 mg. per 100 ml. serum. In 16 patients with chronic cholecystitis the values ranged from 164 to 310, average 221 mg. per 100 ml. serum. In 8 patients with gastric ulcer, the values were from 110 to 181, average 150 mg. The results for patients with other disorders did not give conclusive data, but 3 with diabetes gave 177, 212 and 293 mg., values above normal.

M. B. Richards.

607

WALKER, W. J., LAWRY, E. Y., LOVE, D. E., MANN, G. V., LEVINE, S. A. and STARE, F. J. **Effect of weight reduction and caloric balance on serum lipoprotein and cholesterol levels.** *Amer. J. Med.*, 1953, **14**, 654-664. [Dept. Med., Peter Bent Brigham Hosp., Boston, Mass.]

Of 39 subjects, 29 had cardiovascular disease and the remaining 10 were obese. Twenty-eight were male, and ages ranged from 29 to 68 years.

In a preliminary period subjects were asked to continue their usual diets and maintain their body-weights. After this, energy intake was restricted to 1000 Cal., with 100 g. protein, 50 g. fat and 100 g. carbohydrate. Two eggs were taken daily to ensure a cholesterol intake of 60 mg. A weight loss of 2 lb. weekly was the aim. The weight-losing period was considered ended when a subject failed to lose $\frac{1}{3}$ lb. weekly. A weight-maintenance period followed in which protein and carbohydrate were added to the reducing diet. During this period 20 subjects were told to omit the 2 eggs and to avoid other cholesterol-rich foods for 2 months. Total cholesterol and S_f 12-20, S_f 21-35 and S_f 35-100 lipoproteins were estimated in serum at intervals.

The rate of weight loss varied. The duration of the weight-losing period ranged from 15 to 277 days, mean 106. Weight loss ranged from 7 to 40 lb., mean 19. It was associated with reduction of the 3 types of lipoproteins and cholesterol in most instances. The degree and duration of the reduction were directly related to the initial level of S_f 12-20. The degree of initial obesity was not a determinant of serum lipid changes, and rate of weight loss was only slightly concerned. In the 20 subjects whose cholesterol intake was restricted, serum lipids were not significantly different during restriction from the values obtained during the time of ample intake.

The effect of positive energy balance was studied in 2 subjects. They were given a low-fat, low-cholesterol diet for 2 weeks. The diet was then forcibly fed to produce a weight gain of at least 1 lb. daily. One subject gained 10 lb. in 11 days, the other 11 lb. in 9 days. Significant increases in serum lipoproteins and cholesterol resulted.

It is concluded that if high serum lipid levels contribute to the causation of atherosclerosis, weight reduction is a proper treatment for this disease.—F. C. Aitken.

608

MARFORI-SAVINI, L., VULTERINI, S., MAGALINI, S. and COLTORTI, M. **The serum lipoproteins (by salting out with sodium sulphate) in subjects suffering from coronary atherosclerosis.**

N.A. and R., January 1954

Acta med. scand., 1953, **146**, 148-156. [Ist. Clin. Med. Gen., Univ. Rome.]

The subjects were all men aged 40 to 60 years, 11 normal and 9 suffering from coronary arteriosclerosis, but able to work. Blood cholesterol values were similar in both groups, 223 ± 12 mg. per 100 ml. for normals and 217 ± 15 mg. for those with arteriosclerosis. Blood samples were collected in the fasting state and estimations were made on serum. Protein and cholesterol in the different fractions are tabulated and subjected to factorial analysis.

Although the number of subjects is small the results suggest a decrease in serum albumin in arteriosclerosis and an increase in serum globulin, especially in the fraction salted out by 26 per cent. Na_2SO_4 . The cholesterol of the albumin fraction was lower in arteriosclerosis, quite independently of total albumin and cholesterol levels, although these levels also showed interaction with albumin-bound cholesterol.—D. Duncan.

609

PETERSEN, V. P. **The interrelationships of the individual plasma phospholipids and cholesterol in health and in long-term diabetes mellitus.**

Acta med. scand., 1953, **146**, 375-383. [Med. Univ. Clin., Municip. Hosp., Aarhus.]

A lecture report.

610

MAN, E. B. and PETERS, J. P. **Variations of serum lipids with age.** *J. Lab. Clin. Med.*, 1953, **41**, 738-744. [Dept. Int. Med., Sch. Med., Yale Univ., New Haven, Conn.]

Total cholesterol, lipid P and total fatty acids were estimated at intervals of 10 to 20 years in blood serum from 7 men and 9 women whose ages ranged from 20 to 48 years at the first and from 30 to 65 years at the final examinations. Although significant increases were more frequent than decreases, no lipid component showed a change consistent with advancing age. The findings are discussed in comparison with those of other workers.—D. Harvey.

611

GOVINDAN, K. K. and RADHAKRISHNA RAO, M. V. **Studies on lipotropic factors. 1. Choline content of the serum in normal and in patients suffering from cirrhosis of the liver.** *Indian J. Med. Res.*, 1952, **40**, 505-510. [Indian Counc. Med. Res., Haffkine Inst., Parel, Bombay 12.]

The mean serum choline contents of 17 normal subjects and of 31 adults and 7 infants with cirrhosis did not differ significantly; the mean content for 15 patients with anaemia and malnutrition was slightly lower than the other values.

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After dietetic treatment there was no consistent change, though clinical improvement occurred.

L. Wills.

612

HAGBERG, B. **The iron-binding capacity of serum in infants and children.** *Acta paediat.*, 1953, **42**, Suppl. 93, pp. 80. [Clin. Paediat., Univ. Hosp., Upsala.] French, German and Spanish summaries.

The first chapter of this monograph is a general review of iron metabolism. The original Vahlquist method (Abst. 3163, Vol. 13) of estimating serum Fe has been modified for use with 0.3 ml. in place of 2 ml. serum.

Sera from 54 healthy adults, 26 men and 28 women, gave mean values of 130 ± 5.2 and 330 ± 4.9 $\mu\text{g.}$ per 100 ml. for serum Fe and total Fe-binding capacity, respectively. At parturition the mean values for 21 mothers were 98 ± 6.7 and 470 ± 15.3 $\mu\text{g.}$ and for cord samples from their 23 infants 173 ± 6.9 and 259 ± 10.5 $\mu\text{g.}$ per 100 ml. serum, respectively, for serum Fe and total Fe-binding capacity; the lower value of the latter for the infant is associated with active storage of Fe and the higher for the mother with mobilisation of Fe from the depots.

Between birth and 6 months serum Fe fell significantly from 173 ± 6.9 $\mu\text{g.}$ to 78 ± 6.1 $\mu\text{g.}$ per 100 ml. and remained at nearly this value until 3 years, after which it rose rapidly to almost adult level. Fe-binding capacity also fell during the first 2 months from 259 ± 10.5 to 212 ± 6.6 $\mu\text{g.}$, but between then and 12 months it rose to 394 ± 13.4 $\mu\text{g.}$ and then fell slowly to adult level. Serum Fe attained adult value sooner than Fe-binding capacity did. It is concluded that in infants and children the level of total Fe-binding capacity may indicate the general direction of movement of Fe between storage and mobilisation.

D. Harvey.

613

GERRITSEN, T. and WALKER, A. R. P. **Serum iron and iron-binding capacity in the Bantu.** *S. African Med. J.*, 1953, **27**, 577-581. [Human Biochem. Unit, S. African Inst. Med. Res., Johannesburg.]

Serum Fe was estimated in blood from 15 Europeans and 185 Bantu from East, Central or South Africa; in 171 samples total Fe-binding capacity was also measured. For the Europeans the mean value for Fe was 113 ± 31 $\mu\text{g.}$ per 100 ml. serum, and for the Bantu, grouped according to geographical origin, the means ranged from 98 ± 46 and 100 ± 62 for N. Transvaal and Pondoland to 360 ± 124 $\mu\text{g.}$ for Nyasaland. For total Fe-binding capacity the European mean was 335 ± 42 $\mu\text{g.}$ per 100 ml. and the Bantu means were from 309 ± 48 for Basutoland to 591 ± 142 $\mu\text{g.}$

for Nyasaland. Percentage of Fe saturation was from 26 ± 13 for N. Transvaal to 60 ± 16 for Nyasaland, the European mean being 34 ± 7 . In none was 100 per cent. saturation noted. In general Hb levels were high. Among the Pondos and N. Transvaal Bantu some very low serum Fe values, between 15 and 40 $\mu\text{g.}$, were obtained, and these in the presence of normal or even high Hb.

D. Harvey.

614

MUKHERJEE, C. and MUKHERJEE, S. K. **Studies in iron metabolism in anaemias in pregnancy.** 1. Serum iron. *J. Indian Med. Assoc.*, 1953, 22, 345-351. [Eden Hosp. Women, Med. Coll., Calcutta.]

In a study with 196 women it was shown that during normal pregnancy serum Fe decreased steadily from normal non-pregnant values of about 118 $\mu\text{g.}$ during the early weeks to a mean value which, at term, was about 74 $\mu\text{g.}$ per 100 ml. In pregnancy complicated with either microcytic or macrocytic anaemia the fall was greater, the mean value for the combined series during the last trimester being 51.7 $\mu\text{g.}$ per 100 ml. Blood volume estimations in some of the patients showed that there was a slight rise in total serum Fe in the early weeks of pregnancy, which was followed by a fall to below normal as pregnancy proceeded. The administration of HCl with meals increased Fe absorption and serum Fe during pregnancy; the occurrence of diarrhoea had the opposite effect. Serum Fe in both normal and abnormal pregnancy fell rapidly when a diet almost free from Fe was given. From these findings it is concluded that in women in Calcutta there is a depletion of the Fe reserves of the body during pregnancy.—L. Wills.

615

CLEGG, R. E. and HEIN, R. E. **P^{32} distribution in the serum proteins of the chicken.** *Science*, 1953, 117, 714-715. [Kansas State Coll., Manhattan.]

Eight-week-old chickens were given ^{32}P by mouth and half received an injection of diethylstilboestrol. Serum was taken from the blood of these birds and from laying hens which had eaten ^{32}P .

Electrophoretic component 1 was present and had a high activity in oestrogen-treated birds and laying birds, but was absent from non-laying birds which were not treated with oestrogen. Component 5 was present in the sera of all birds but was increased and had a greater activity in laying and oestrogen-treated birds than in non-laying and untreated birds.—R. Hill.

See also Absts. 56, 107, 332-34, 336, 691, 862, 919, 920, 1085, 1097, 1100, 1278.

LYMPH, CEREBROSPINAL FLUID, ETC.

616

MONNIER, D. and BESSO, Z. **Étude polarographique de la salive. [Polarographic study of saliva.]** *Anal. chim. Acta*, 1953, 8, 572-582. [Lab. Chim. Minérale, Univ. Geneva.] English and German summaries.

617

AMATRUDA, T. T. (Jr.) and WELT, L. G. **Secretion of electrolytes in thermal sweat.** *J. Appl. Physiol.*, 1953, 5, 759-772. [Dept. Int. Med., Sch. Med., Yale Univ., New Haven, Conn.]

Sweating was studied in 46 experiments on 19 subjects. Samples were collected in a plastic sleeve sealed to the arm. There was great individual variation in concentrations of urea and electrolytes. There was some direct correlation between the concentrations of Na and Cl in sweat and the rate of sweating or the rise of rectal temperature, and some inverse correlation between the concentrations of Na and NH_3 in sweat, and the concentration of K and total volume of sweat lost. Intravenous infusions of isotonic, hypertonic or hypotonic fluids before exposure to heat almost always prolonged the latent period before sweating began. Hypotonicity tended to increase the rate of sweating and hypertonicity to decrease it. Acidosis produced by ingestion of NH_4Cl decreased the length of latent period, but alkalosis was without effect. A constant relation appeared between Na and Cl in sweat and extracellular fluid. The validity of analysis of thermal sweat as a diagnostic or research tool is questioned.—D. Duncan.

618

BERENSON, G. S. and BURCH, G. E. **A study of the sodium, potassium and chloride contents of thermal sweat of man collected from small isolated areas of skin.** *J. Lab. Clin. Med.*, 1953, 42, 58-77. [Dept. Med., Sch. Med., Tulane Univ., New Orleans, La.]

619

AHLMAN, K. L., ERÄNKÖ, O., KARVONEN, M. J. and LEPPÄNEN, V. **Mineral composition of thermal sweat in healthy persons.** *J. Clin. Endocrinol.*, 1953, 13, 773-782. [Dept. Physiol., Inst. Occupat. Health, Helsinki.]

Samples of thermal sweat were collected from 67 men in different degrees of physical training, of whom 31 were champion lumbermen, 19 were soldiers and regarded as intermediate and 17 had sedentary occupations; 69 women, nurses or students, also provided samples. Mean values for Na and Cl for men in the different groups were similar, but for Na a sex difference appeared, the value for women being higher than that for men.

N.A. and R., January 1954

For K the sex difference in the same direction was even more significant. In both sexes the positive correlation between Na and Cl was linear and highly significant, $r = 0.977 \pm 0.0039$ for men and 0.913 ± 0.020 for women, but, owing to a higher Na : Cl ratio in women, the equations of the regression lines differed for the sexes.

Because of the high correlation of Na with Cl the simple titrimetric estimation of Cl is considered a satisfactory measure of adrenocortical activity, and the results indicate that, although functional capacity of the adrenal cortex in man may be of importance in relation to his physical fitness, the level of activity of the adrenals while the subject is at rest is unaffected by his physical condition. No satisfactory explanation of the sex differences could be advanced.—D. Duncan.

620

ERÄNKÖ, O. **Effect of heavy muscular work on the mineral composition of thermal sweat.** *Sport Med.*, 1953, 64-68. [Inst. Occupational Health, Helsinki.]

The results obtained from athletes (Abst. 540, Vol. 23) were compared with those from 135 other persons of different degrees of fitness. There was no significant difference in composition of thermal sweat at rest. Women had a significantly higher K concentration and Na : Cl ratio than men. Na values could be calculated with high accuracy from the easily estimated Cl values.—D. Duncan.

621

MÜNICH, W. **Untersuchung der Kammerwasserproteine des Kaninchens mittels der Papier-electrophorese. [Study of the proteins of the aqueous humour of the rabbit by paper electrophoresis.]** *v. Graefes Arch. Ophthalmol.*, 1953, 154, 50-57. [Augenklin., Univ. Würzburg.]

TISSUES

622

FORBES, R. M., COOPER, A. R. and MITCHELL, H. H. **The composition of the adult human body as determined by chemical analysis.** *J. Biol. Chem.*, 1953, 203, 359-366. [Div. Animal Nutrit., Urbana, Ill.]

The subject was a white male 46 years of age and, according to Edwards's nomogram (*Amer. J. Hyg.*, 1942, 35, 307), 23 per cent. below the average weight for his age and height. The whole body contained water 55.13, ether extract 19.44, crude protein 18.62, ash 5.43, Ca 1.907 and P 0.925 per cent. The fat-free body contained water 69.38, crude protein 23.43, ash 6.83, Ca 2.40 and P 1.164 per cent. The contents of tissues and organs are also given.

The water and fat contents were within the ranges of values estimated by indirect measure-

ments on living subjects. The Ca : P ratio of the whole body was about 2 : 1.—D. Duncan.

623

BASS, D. E., KLEEMAN, C. R., QUINN, M. and KLIMAS, J. A. **Optimal time of diffusion of thiocyanate ion in normal men : correlation of thiocyanate space with body weight, surface area and lean body mass.** *J. Appl. Physiol.*, 1953, 6, 33-38. [Dept. Army Quartermaster Climatic Res. Lab., Lawrence, Mass.]

624

KEYS, A. and BROŽEK, J. **Body fat in adult man.** *Physiol. Rev.*, 1953, 33, 245-325. [Lab. Physiol. Hyg., Sch. Pub. Health, Univ. Minnesota, Minneapolis.]

625

IVERSEN, K., VIDEBAEK, A. and KIRK, J. E. **Casual skin lipid levels in individuals of various ages.** *J. Gerontol.*, 1953, 8, 312-317. [Div. Gerontol., Sch. Med., Washington Univ., St. Louis, Mo.]

Lipid material was extracted with ether from an area of 10 sq. cm. on the forehead and from three areas of 2 sq. cm. on the back of the hands of 72 men and 72 women between the ages of 13 and 90 years.

No significant correlation was observed between age and the amount of epidermal lipid ; the mean lipid value observed for the forehead, in mg. per sq. cm., was 0.239 in men and 0.205 in women ; the corresponding figures for the back of the hand were 0.072 and 0.080.—G. A. Garton.

626

KRAYBILL, H. F., GOODE, E. R., ROBERTSON, R. S. B. and SLOANE, H. S. **In vivo measurement of body fat and body water in swine.** *J. Appl. Physiol.*, 1953, 6, 27-32. [Bur. Animal Indust., U.S. Dept. Agric., Beltsville, Md.]

Data were obtained on sp. gr., body fat and water content and thickness of back fat of 24 pigs aged 90 to 466 days, by methods applied either to the intact animals or to their carcasses. The mean values, with standard deviations and ranges, were sp. gr. 1.016 ± 0.02 (0.990 to 1.057) ; body fat, antipyrine method 36.7 ± 0.10 (12.0 to 49.9), sp. gr. method 40.8 ± 0.09 (19.9 to 54.5), analysis 38.4 ± 0.09 (17.8 to 53.1) per cent. ; body water, antipyrine method 46.8 ± 0.07 (36.7 to 64.5), sp. gr. method 44.1 ± 0.07 (33.8 to 59.6) per cent. ; thickness of back fat, 34.9 ± 8.09 (17.0 to 47.2) mm.

From the relations between these and from consideration of the results of other workers theoretical equations were developed to permit

calculation of body water and fat percentages:

$$\text{Body water} = 100 \left(4.400 - \frac{4.021}{\text{sp. gr.}} \right) \text{ per cent.,}$$

$$\text{and Body fat} = 100 \left(\frac{5.405}{\text{sp. gr.}} - 4.914 \right) \text{ per cent.,}$$

where sp. gr. is the body specific gravity of the eviscerated animal.—D. Harvey.

627

WINTER, G. and NUNN, W. **The composition of the blubber fat of crabeater seal.** *J. Sci. Food Agric.*, 1953, **4**, 439–442. [Defence Res. Labs., Dept. Supply, Melbourne.]

Blubber fat was extracted with acetone and ether from the belly of a crab-eater seal (*Lobodon carcinophagus*). The methyl esters of the component fatty acids derived by methanolysis of the fat were separated into groups of differing unsaturation by low-temperature crystallisation from acetone. Each group of esters was fractionally distilled *in vacuo*, with a spinning-band column. From analysis of each fraction the whole fat was estimated to have the following percentage composition by weight: myristic acid 4.7, palmitic acid 10.1, stearic acid 2.1, unsaturated C₁₄ 3.2, unsaturated C₁₆ 19.8, unsaturated C₁₈ 30.3, unsaturated C₂₀ 19.2 and unsaturated C₂₂ acids 10.6.

G. A. Garton.

628

WINTER, G. and NUNN, W. **The component fatty acids of elephant-seal oil: variations and relationship to blubber fats of other seals.** *J. Sci. Food Agric.*, 1953, **4**, 442–448. [Defence Res. Labs., Dept. Supply, Melbourne.]

Blubber fat was extracted from male and female elephant seals ranging in age from pups to adults taken at different seasons at Heard Island and Macquarie Island. The fatty acid composition of the fats was estimated as described in the preceding abstract.

There was little correlation between fat composition and size, age or sex of the animal. The following fatty acids were identified: lauric 0 to 0.4, myristic 1.1 to 6.3, palmitic 8.2 to 14.0, stearic 2.1 to 4.6, arachidic 0 to 0.7, behenic 0 to 0.2, unsaturated C₁₄ 0.6 to 2.3, unsaturated C₁₆ 8.2 to 17.8, unsaturated C₁₈ 32.9 to 44.4, unsaturated C₂₀ 11.7 to 25.3, unsaturated C₂₂ 5.9 to 13.2 and unsaturated C₂₄ 0 to 3.1 molecules per cent.—G. A. Garton.

629

HARRISON, M. F. **Effect of starvation on the composition of the liver cell.** *Biochem. J.*, 1953, **55**, 204–211. [Dept. Exp. Med., Univ. Cambridge.]

Changes in the liver were studied in rats fasted for 1, 2, 4 or 6 days, with access to water. Complete

data are presented as the mean values for 7 animals for liver water, protein, glycogen, neutral lipids, phospholipins, nucleic acids, total and inorganic Fe, Cu, Zn, K, Na, Cl and P.

Reduction in size of liver appeared to be the result of loss of cytoplasmic, and not of nuclear, material. In 24 hr. glycogen almost disappeared from the liver cells of both sexes, but later a sex difference arose, since it increased somewhat in the male and not in the female. Neutral lipid also differed at the end of the fast, being greater in the liver cells of females than of males. Throughout the fast there was loss of protein and in the last 2 days this also was greater in the female than in the male. Fe, Cu and Zn remained unchanged. Losses of water and K ran almost parallel with that of protein throughout the fast.—D. Harvey.

630

HAAN, A. M. F. H. **Electrophoresis of the non-structural proteins from normal and atrophic muscles of the rabbit and of man.** *Biochim. biophys. Acta*, 1953, **11**, 258–269. [Lab. Physiol. Chem., Univ. Utrecht.] French and German summaries.

631

KLENK, E. and FAILLARD, H. **Zur Kenntnis der Fettsäuren der Gehirncerebroside. Die Konstitution der ungesättigten Oxy Säuren. [The fatty acids of brain cerebroside. The constitution of the unsaturated hydroxy acids.]** *Hoppe-Seyler's Ztschr.*, 1953, **292**, 268–275. [Physiol. Chem. Inst., Univ. Cologne.]

632

KLENK, E., DEBUCH, H. and DAUN, H. **Zur Kenntnis des Gehirnlécithins. [Brain lecithin.]** *Hoppe-Seyler's Ztschr.*, 1953, **292**, 241–250. [Physiol. Chem. Inst., Univ. Cologne.]

633

FUKUDA, M. **Studies on the contents of mammalian livers in protein and nucleic acids. 1. Relation between the body weight and the DNA content of liver nuclei in postnatal growth of the rat. 2. The number and the composition of liver cells in postnatal growth of the rat.** *Med. J. Osaka Univ. (Jap. Ed.)*, 1953, **5**, 407–416; 417–428. [Dept. Pathol., Inst. Microbial Dis., Univ. Osaka.] In Japanese: English summary.

634

COLE, P. G., LATHE, G. H. and RUTHVEN, C. R. J. **The application of countercurrent methods to the fractionation of lipid material from human placenta.** *Biochem. J.*, 1953, **55**, 17–23.

N.A. and R., January 1954

[Bernhard Baron Mem. Res. Labs., Queen Charlotte's Maternity Hosp., London.]

With a solvent system of carbon tetrachloride, methanol and water, the lipids of human placenta were fractionated by counter-current distribution. The fractions were analysed for cholesterol, iodine value and N and P content of non-cholesterol material and, after hydrolysis, for bases and phosphates by paper chromatography.

Several fractions contained ethanolamine, choline and serine; glutamic acid was widely distributed, suggesting some general relationship between this amino-acid and placental lipids. The N and P contents of the fractions were not consistent with the occurrence of the usual phospholipids, and it is suggested that the high P and low N values found may be due to phosphate-containing lipids of a new type. The composition of placental lipids is compared with the composition of brain lipids distributed by the same counter-current technique.

G. A. Garton.

635

CREMER, H. D., BÜTTNER, W., DITTMANN, G. and VOELKER, W. Ernährungsfaktoren bei Zahn- und Knochenbildung. 2. Der Mineralgehalt der Zähne bei Carieskost. [Diet components in the formation of teeth and bones. 2. Minerals in teeth with a caries-producing diet.] *Biochem. Ztschr.*, 1953, **324**, 83-88. [Physiol. Chem. Inst., Univ. Mainz.]

For part 1, see Abst. 899, Vol. 22.

A study was made of minerals in the teeth of the second, third and fourth generations of rats kept on a caries-producing diet consisting of casein 24, cane sugar 63, olive oil 5, liver 4, and Shaw's salt

mixture 4 per cent., with vitamin B₁ 2.5, riboflavin 1, pyridoxine 1, nicotinic acid 10, Ca pantothenate 1.5 and tocopheryl acetate 2.5 mg., vitamin A 500 and vitamin D 10 I.U. per 100 g. Controls had casein 50, cane sugar 14, lard 20, and olive oil 8 per cent., otherwise their diet was the same as that of the experimental rats. Rats were killed either at 17 to 21 days of age when the molars were about to erupt, or at 10 to 15 months. The upper teeth were cleaned and dissolved in 2 N HCl and Ca, P, F and Mg were estimated.

Contrary to the results of Hartles (Abst. 838, Vol. 21), the Ca and P contents of the teeth of experimental and control rats were similar. F content fluctuated between 6 and 28 mg. per cent. but a difference between the 2 groups could not be established. On the other hand, the Mg content of first molars of fourth generation rats on the caries-producing diet was only about 3/4 that of control rats. This difference was not found in the incisors.—W. M. Deans.

636

LEICESTER, H. M. The biochemistry of the teeth. *Annu. Rev. Biochem.*, 1953, **22**, 341-350. [Dept. Physiol. Sci., Coll. Phys. Surg., San Francisco, Calif.]

637

HESS, W. C., LEE, C. Y. and NEIDIG, B. A. The amino acid composition of enamel protein. *J. Dent. Res.*, 1953, **32**, 585-587. [Dept. Biol. Chem., Sch. Med., Georgetown Univ., Washington, D.C.]

See also Absts. 500, 567.

DUCTLESS GLANDS AND HORMONES

638

SCHABERG, A. and STRAUB, M. The adrenals in hunger cachexia. *Doc. Med. geograph. trop.*, 1953, **5**, 49-55. [Pathol. Lab., Municip. Hosps., Rotterdam.]

In 1946 post-mortem examination of 60 Indonesians with hunger cachexia, including both dry and wet forms, showed a mean bodyweight of 29 kg. compared with from 40 to 50 kg. for normal Indonesians. The blood sugar value estimated after death was extremely low in many of them. There were constant characteristic changes in the adrenal glands; they were small and flat and the yellow cortex was reduced so that the medullary zone predominated. Microscopically the cortex showed a relative broadening of the glomerular zone, the cells of which tended to be undifferentiated and had in places penetrated the capsule. The fascicular zone was very narrow; the cells

were poor in lipids and strongly eosinophilic. The reticular zone was relatively large and showed central accumulations of lipofuscin.

The picture of complete exhaustion of the adrenal glands seen in the Indonesian patient differs greatly from that in similar cases in Europe, where there is hyperplasia of the cortex with depletion of lipid. It is suggested that the apparently contradictory findings can be explained in accordance with Selye's picture of the response of the adrenal glands to stress. The changes in the Europeans occurred in persons previously well fed and were of the "resistant phase" type, whereas in the malnourished Indonesians the glands were in the "resistant phase" before starvation occurred and showed changes characteristic of the "exhaustion phase" when hunger cachexia developed.—L. Wills.

639

BURNS, T. W., ENGEL, F. L., VIAU, A., SCOTT, J. L. (Jr.), HOLLINGSWORTH, D. R. and WERK, E. (with ROBERTSON, E.) **Studies on the interdependent effects of stress and the adrenal cortex on carbohydrate metabolism in man.** *J. Clin. Invest.*, 1953, **32**, 781-791. [Dept. Med., Duke Univ., Durham, N.C.]

Glucose, glucose-insulin and insulin tolerance tests were made on 143 normal medical students and 53 patients, 4 with severe neuroses and the remainder with organic disease. Except in a diet control experiment, all were on normal diets.

In a control experiment ingestion of 200 or 400 mg. cortisone acetate by groups of 10 normal subjects produced a significant and sustained increase in fasting blood sugar during the period from 4 to 7 hr. afterwards. In glucose tolerance tests on normal subjects those who received cortisone showed impaired tolerance, but their glucose-insulin or insulin tolerance was not affected. Restriction of food intake in normal subjects did not affect these results. In ill subjects cortisone produced a strikingly greater impairment of glucose and glucose-insulin tolerance than did illness alone. The glucose-insulin test, with or without cortisone, showed the greatest difference between normal and ill subjects. Cortisone-treated patients exhibited only slightly greater insulin resistance in this test than untreated patients, but all showed much greater resistance than normal subjects receiving cortisone over a short or long period.

The results are fully discussed with reference to the concept that adrenal hormone influences the metabolic response to stress. It is considered that these responses are not direct consequences of increased adrenal cortical secretion.—D. Duncan.

640

STERLING, R. E. and LONGWELL, B. B. **The effect of type and quantity of food intake on the response of the adrenal gland to cold exposure.** *Endocrinology*, 1953, **53**, 106-113. [Dept. Biochem., Univ. Colorado Sch. Med., Denver.]

Estimations of adrenal cholesterol and liver glycogen were used to study adrenal cortical activity in response to stress in 4 experiments on adult male rats. In the first experiment the rats were fed only at night, on Purina chow. Before the experiment, groups 1 and 3 were fed as usual, groups 2 and 4 were fasted for 24 hr., and groups 5 and 6 received half and one-quarter, respectively, of their usual food consumption. Groups 3, 4, 5 and 6 were exposed to a temperature of 3° to 5° C. for 4 hr., and then all animals were anaesthetised with Nembutal before removal of adrenals and livers for analysis. Group 1, controls, had adrenal cholesterol contents of 3.7 ± 0.21 per cent., and the mean liver

glycogen content was 3.60 per cent. Fasting alone had no effect on adrenal cholesterol. Exposure to cold without fasting reduced adrenal cholesterol to 3.0 ± 0.18 and liver glycogen to 2.7 per cent. In groups 4, 5 and 6, partly fed rats showed lower adrenal cholesterol values than fasted rats, namely, 2.3 ± 0.25 , 2.0 ± 0.14 and 2.0 ± 0.12 per cent., respectively. There was no direct correlation between absolute glycogen values and adrenal response in individual animals.

In 2 other experiments groups of rats received high-fat, high-carbohydrate or high-protein diets for 7 days before exposure. In the first of these experiments the diets were given to appetite, and in the second energy intake was restricted to that of the high-protein group, about three-quarters of the voluntary intake of the high-fat and high-carbohydrate groups. In a final experiment this energy intake was allowed to rats on Purina chow.

With unrestricted food intake high-fat and high-carbohydrate diets afforded more protection against adrenal cholesterol depletion than did high-protein or stock diets. Food restriction associated with high fat and carbohydrate intakes led to almost normal liver glycogen values in non-stressed groups, 3.1 and 4.2 per cent., respectively. Cholesterol values were high, 5.4 ± 0.27 and 5.1 ± 0.36 per cent., and exposure to cold had little effect, 5.0 ± 0.36 and 5.1 ± 0.41 per cent., respectively. Exposure to cold after the high-protein diet reduced adrenal cholesterol from normal values to 2.8 ± 0.29 per cent.

It was concluded that fasted animals with depleted liver glycogen responded more readily to stress, but results do not suggest that liver glycogen was the only condition modifying the adrenal response; the unexpected effect of high protein intake was thought to indicate a more complex phenomenon.—D. Duncan.

See also Absts. 446, 528, 712.

641

HEINBECKER, P. **Recent advances in our knowledge of the thyroid gland.** *Ann. Surg.*, 1952, **136**, 145-161. [Dept. Surg., Sch. Med., Washington Univ., St. Louis, Mo.]

642

MALMROS, H. and SWAHN, B. **Lipid metabolism in myxedema.** *Acta med. scand.*, 1953, **145**, 361-369. [Dept. Med., Univ. Hosp., Lund.]

In a study of blood lipids of 2 men and 11 women with myxoedema, the amounts of total serum lipid, cholesterol and phospholipins were found to be abnormally high. Administration of *l*-thyroxine brought about a decline to normal plasma levels. It is suggested that serum lipid analysis is often more reliable than measurement of B.M.R. in the assessment of thyroid function.—G. A. Garton.

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643

PICKERING, D. E., SMYTH, F. S., VAN WAGENEN, G. and FISHER, D. A. **Growth and metabolism in normal and thyroid-ablated infant rhesus monkeys (*Macaca mulatta*).** 1. Growth and metabolism in normal infant rhesus monkeys (*Macaca mulatta*).

PICKERING, D. E. and FISHER, D. A. 2. Growth and metabolism in thyroid-ablated infant rhesus monkeys (*Macaca mulatta*).

PICKERING, D. E. and FISHER, D. A. 3. Growth and metabolism following l-thyroxine administration in thyroid-ablated infant rhesus monkeys (*Macaca mulatta*).

PICKERING, D. E., FISHER, D. A. and SCOTT, K. G. 4. Radiosodium (Na^{24}) space in normal and thyroid-ablated infant rhesus monkeys (*Macaca mulatta*). *Amer. J. Dis. Child.*, 1953, **86**, 1-10; 11-22; 147-156; 157-161. [Dept. Paediat., Univ. California Med. Sch., San Francisco.]

1. Some aspects of growth and metabolism were studied in 4 infant macaque monkeys from birth to 140 days. Feeding was unrestricted. N, Ca and P balances were estimated during two or three 72-hr. periods. The diet contained carbohydrate 60 to 65, protein 12 to 15 and fat 20 to 25 per cent. All the animals gained about 10 ± 1 g. per kg. daily during the first 30 days and then the average weight gain declined to 5 ± 1 g. per kg. daily. The food intake declined from 375 to 200 Cal. per kg. daily at 140 days. N retention paralleled growth and between 40 and 140 days 104 ± 4 mg. N per g. weight gain was retained. Ca and P retentions were more variable, but the ratio of Ca to P retained was constant. Ca retention was on the average 25 mg. per g. weight gain after 75 days.

2. Growth and metabolic changes were studied over a 4-month period in 2 young monkeys whose thyroid glands were ablated after birth and in 2 older animals so treated at 4 and 5 months. Ablation was by intraperitoneal injection of ^{131}I in isotonic carrier-free solution containing about 1 mC. per ml. Serum butyl-extractable I in normal young monkeys ranged from 4 to 8 μg . per 100 ml. Thirty or more days after the final dose of ^{131}I this value ranged from 0 to 1 μg . per 100 ml. in all 4 monkeys. Parathyroid integrity was confirmed by periodic Ca and inorganic P analyses on sera.

Between 15 and 20 days after thyroid ablation in the 2 young monkeys and after about 35 days in the 2 older monkeys striking changes developed, resulting in a clinical picture similar to that of the athyroid human infant, i.e., macroglossia, generalised myxoedema, sluggish movements, increase of somnolence and a drop in body temperature when placed in a cooler room. Growth stopped and the animals assumed a crouching posture, skin

became thick, hair coarse and scanty, eruption of teeth was delayed and there was enlargement of the palatoglossal and palatopharyngeal arches in the young monkeys. Growth of the long bones was delayed, as well as maturation of the whole skeleton. There was enlargement of the sella and a flattening of the basiocciput.

Voluntary energy intake dropped by half to 100 ± 10 Cal. per kg. daily. N, Ca and P retentions were greatly reduced. Urinary creatine and creatinine were on the average about half normal.

B. W. Simpson.

644

CATZ, B., EL RAWI, I. and GEIGER, E. **Activity of thyroid of cold-exposed rats evaluated by ^{131}I uptake and histometric studies.** *Amer. J. Physiol.*, 1953, **174**, 29-32. [Dept. Med., Univ. S. California, Los Angeles.]

645

LAMBERG, B. A. **Radio-active phosphorus as indicator in a chick assay of thyrotropic hormone.** *Acta med. scand.*, 1953, **145**, Suppl. 279, pp. 79. [Inst. Pharmacol., Univ. Helsinki.]

It was found by Borell (Title 647, Vol. 16) that in response to thyrotropic hormone the total P content of the guinea pig's thyroid increased with the height of the epithelial cells, and later (Borell and Holmgren, *Acta endocrinol.*, 1949, **3**, 331) that when ^{32}P was given the increased activity was in direct proportion to the increased cell height.

The experimental animals were 1379 chickens from 1 to 3 days old, kept in a controlled environment and fed from the second day on a commercial chick ration. The thyrotropic substance (TSH) used was a standard preparation, Ambion, injected subcutaneously. ^{32}P was also given subcutaneously as 100 mg. sodium phosphate containing 2 to 12 μC . tracer. The estimation of radio-activity in tissue samples and the histological and statistical methods are discussed.

TSH increased the uptake of ^{32}P by the thyroid, the maximum uptake occurring 8 hr. after TSH injection and being maintained until 12 hr. The effect of TSH on the thyroid epithelium reached its maximum at 4 hr. and was maintained at least up to 8 hr. For assay of TSH it was therefore given 8 hr., and ^{32}P 60 min., before the chickens were killed.

A linear log dose response relation was found to be valid within the range from about 0.005 to 0.05 or 0.1 Junkmann-Schoeller unit. The reaction appeared to be specific for TSH, and the uptake of ^{32}P was at least as specific an end reaction as the increase in percentage of epithelium.

There were fairly large variations in response with different broods of chickens, and a standard

curve could not be developed, so unknown TSH preparations must be tested against a standard preparation. Chickens aged 1, 2 and 3 days were equally responsive. For a 4-point assay the amount of unknown substance required is at least $n \times 0.025$ unit, where n is the number of animals per point. It is suggested that the method may be used for titration of TSH in body fluids.

D. Duncan.

646

MATHER, H. G. **Hyperparathyroidism with normal serum calcium.** *Brit. Med. J.*, 1953, ii, 424-425. [King's Coll. Hosp., London.]

647

DAVIES, B. M. A. and GORDON, A. H. **The effect of parathyroid hormone on phosphate excretion in the rat.** *J. Endocrinol.*, 1953, 9, 292-300. [Nat. Inst. Med. Res., Mill Hill, London, N.W.7.]

Rats with parathyroids removed were given injections of parathyroid hormone in different amounts. Decreases of serum phosphate and increases of urine phosphate were related to the quantity of hormone injected, though the increase in response became less when more than about 3 units were given. The response in different animals to a particular quantity of hormone varied with the initial phosphate content of serum or urine.

The individual variations in response were too great for this technique to be useful in its present form as a method of estimating the parathyroid hormone.—R. Hill.

See also Abst. 1301.

648

CAMPBELL, J., HAUSLER, H. R., MUNROE, J. S. and DAVIDSON, I. W. F. **Effects of growth hormone on dogs.** *Endocrinology*, 1953, 53, 134-162. [Dept. Physiol., Univ. Toronto.]

Four adult dogs received, after a preliminary control period, 2 daily injections of bovine growth hormone for 7 days, in amounts sufficient to produce diabetes within about 3 days. One dog died in diabetic coma, but the other 3 were allowed to recover for 30 days and were then given a second series of injections for 6 to 8 days before being killed. Control dogs received injections of bovine plasma albumin. The diet consisted of ground horse muscle 300 g., Purina checkers 100 g. and sucrose 40 g., in 2 meals, but the experimental dogs received only half this amount after the end of the first week of injections. Blood volumes were estimated by the T 1824 method and blood and urine samples were collected for analysis.

The growth hormone preparation in the first period, in doses of 3.5 mg. per kg. bodyweight

daily, produced pronounced diabetes, with blood sugar values above 300 mg. per 100 ml., glycosuria, polyuria, polydipsia, ketonuria and lipaemia. The dogs became lethargic, respiratory rate increased, with vomiting, loss of appetite, dehydration and tarry stools suggesting haemorrhage from the upper alimentary tract. The 3 survivors recovered within 4 to 6 days after the injections ceased. In the second period the dose of hormone was reduced to 2 mg. per kg. daily and diabetes occurred in 2 dogs.

Growth hormone increased the red blood cell sedimentation rate and decreased the haematocrit, Hb concentration and red cell count. Plasma volume increased by 10 to 15 per cent. above control values; the reductions in cell values were due to dilution by increased plasma volume. Total plasma protein was increased by the increased volume; the effect on plasma albumin was not definite, but globulin was increased and the albumin:globulin ratio was low. Fibrinogen was considerably increased. Clotting time and prothrombin time showed rapid and progressive decreases. Leucocyte counts increased, especially those of neutrophil granulocytes.

At the end of the second injection period the livers of the 3 dogs given growth hormone had an average weight more than twice that of 5 controls. Fat-free solids, water and fat in liver were all increased, especially fat. Little insulin could be obtained from the pancreas. The significance of all these results is discussed.—D. Duncan.

649

OTTAWAY, J. H. **The insulin-like action of growth hormone.** *Brit. Med. J.*, 1953, ii, 357-359; *Biochem. Biophys. Acta*, 1953, 11, 443-445. [Dept. Biochem., University Coll., London.]

650

SALTER, J. and BEST, C. H. **Insulin as a growth hormone.** *Brit. Med. J.*, 1953, ii, 353-356. [Dept. Physiol., Univ. Toronto.]

In rats from which the pituitary had been removed, slow-acting insulin produced true growth, confirmed by measurement. Controls without insulin did not grow. Failure of production of insulin may therefore be one of the causes of cessation of growth after removal of the pituitary.

I. Leitch.

651

CAHN, T. and HOUGET, J. **Influence de l'insuline sur la production calorifique du lapin. [Effect of insulin on heat production in the rabbit.]** *J. Physiol., Paris*, 1953, 45, 429-441. [Lab. Physiol., Inst. Biol. Physico-Chim., Paris.]

Energy exchange was studied in rabbits over 48 hr., each day being divided into a 7- and a 17-hr. period. Each rabbit was subjected to a control

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experiment and, 4 to 8 days later, to an experiment in the course of which insulin was injected.

Whether the rabbits were fasted or fed, insulin had no effect upon the 24-hr. energy exchange; there was sometimes an increase in output during the first 7 hr., but this was always compensated later. There was no regular variation in R.Q., and insulin is not thought to favour combustion of sugars.—D. Duncan.

See also Absts. 446, 530.

652

EBBEL, FONTAINE, R. and MANDEL, P. Action de la folliculine sur le bilan du Ca au cours d'un régime couvrant le minimum des besoins calciques. [Effect of folliculin on calcium balance

on a diet supplying minimum calcium requirement.] *C.R. Soc. Biol.*, 1953, 147, 508-511.

When 9 adult female rats receiving a diet containing the minimum Ca requirement were given daily injections of folliculin retention of Ca and P was much increased. Ca equilibrium was controlled during a pre-period of 15 days and the experimental period lasted 12 days, estimations being made on the combined excreta of 3 days. Faecal excretion of Ca decreased by 42 per cent. or 2.01 mg. and of P by 36 per cent. or 2.97 mg. daily. Urinary excretion of P diminished by about 10 per cent. in 8 of 9 rats; urinary Ca showed in 7 a slight increase, insignificant relative to the decrease of intestinal excretion.—M. B. Richards.

See also Abst. 532.

ENERGY EXCHANGE AND SPECIFIC DYNAMIC ACTION

653

KREBS, H. A. Some aspects of the energy transformation in living matter. *Brit. Med. Bull.*, 1953, 9, 97-104. [Med. Res. Counc. Unit Res. Cell Metabol., Dept. Biochem., Univ. Sheffield.]

654

KRAAN, J. G., MORRISON, F., STRYDOM, N. B. and WYNDHAM, C. H. A study of the effects of acclimatisation to heat. *S. African J. Med. Sci.*, 1953, 18, 32. *Proc.* [Lab. Appl. Physiol., Transvaal Chamber of Mines.]

655

HILL, A. V. A reinvestigation of two critical points in the energetics of muscular contraction. *Proc. Roy. Soc. [B]*, 1953, 141, 503-510. [Physiol. Lab., University Coll., London.]

656

PIROGOV, L. S. [Factors limiting working capacity of the organism in strenuous work.] *Trudy Vses. Obsch. Fiziol., Biokhim., Farmakol.*, 1952, No. 1, 96.

657

MAHADEVA, K., PASSMORE, R. and WOOLF, B. Individual variations in the metabolic cost of standardized exercises: the effects of food, age, sex and race. *J. Physiol.*, 1953, 121, 225-231. [Dept. Pub. Health, Univ. Edinburgh.]

Data exist whereby B.M.R. can be assessed from body size, sex, age, race and climate, but little is known of the effect of these on metabolism during muscular exercise. An investigation was made of the energy expenditure of 50 Europeans and Asiatics of both sexes when performing 2 standard exercises, stair-climbing and walking. The data

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are analysed statistically to show that bodyweight can be used to predict energy expenditure closely and that use of height, age, sex, race or resting metabolism does not give additional information on energy expenditure. Further, in climbing stairs, where a large proportion of the energy expended is used to raise the body, the metabolic cost is directly proportional to bodyweight.—A. W. Boyne.

658

KELVIN, R. P., KOSTIAL, K., LIPPOLD, O. C. J. and WHITFIELD, J. The changes in energy expenditure during the attainment of skill with a pursuit meter. *J. Physiol.*, 1953, 120, 42P-43P. [Dept. Physiol., University Coll., London.]

659

DE WIJN, J. F. Beschouwingen over enige onderzoekingen omtrent voeding en arbeid. [Some studies of diet and work.] *Voeding*, 1953, 14, 360-368.

Recent studies of energy expenditure, mostly in industrial work, are briefly summarised.

660

JOHNSTON, J. E. and FRYE, J. B. (Jr.) Comparative heat tolerance of Holstein and crossbred Red Sindhi-Holstein heifers when exposed to elevated temperatures and humidities. *J. Dairy Sci.*, 1953, 36, 585. *Proc.* [Louisiana State Univ., Baton Rouge.]

661

BRANTON, C., JOHNSTON, J. E. and MILLER, G. D. Physiological and hereditary responses of lactating Holstein-Friesian and Jersey cows to natural environmental temperature and humidity. *J. Dairy Sci.*, 1953, 36, 585-586. *Proc.* [Louisiana State Univ., Baton Rouge.]

662

- ROBINSON, K. W. and KLEMM, G. H. **A study of heat tolerance of grade Australian Illawarra Shorthorn cows during early lactation.** *Austral. J. Agric. Res.*, 1953, **4**, 224-234. [Sir William Macgregor Sch. Physiol., Univ. Queensland, Brisbane.]

The reactions were studied of four 3-year-old grade Australian Illawarra Shorthorn cows, 3 weeks calved, exposed for 7 hr. twice weekly for 6 weeks to different combinations of dry-bulb temperatures ranging from 86° to 108.5° F. and absolute humidity from 8 to 16 g. moisture per c. ft.

Temperatures up to 95° F. appeared not to affect the animals, but higher temperatures caused a marked rise of body temperature. Pulse rate was unaffected throughout. At constant humidity of 12 g. per c. ft. and at increasing air temperatures the cows appeared contented up to 104° F., and water was drunk when offered. At air temperature above 104° F. rumination ceased, water was not taken, and panting occurred; at 105° F. sweating occurred freely, and at 106° F. all animals showed marked distress, and above 107° F. signs of heat stroke. A rise of humidity caused stress at lower dry-bulb temperatures. On comparing the reactions of the Shorthorns with those of 4 Jersey cows of similar age and lactation it was found that the Jerseys had a much greater heat tolerance.—E. L. B. Haskew.

663

- BLAXTER, K. L., GRAHAM, N. M. and ROOK, J. A. F. **Respiration calorimetry with farm animals.** *J. Physiol.*, 1953, **121**, 39P-40P. [Hannah Dairy Res. Inst., Kirkhill, Ayr.]

664

- BLAXTER, K. L. and ROOK, J. A. F. **The effect of Mg deficiency on the energy exchange of calves.** *J. Physiol.*, 1953, **121**, 48P-49P. [Hannah Dairy Res. Inst., Kirkhill, Ayr.]

665

- KNORRE, E. P. and KNORRE, E. K. **Ocobennosti termoregulyatsii y locya.** [Special features of thermoregulation in elks.] *Zool. Zh.*, 1953, **32**, 140-149. [Pechoro-Ilychsk. Gosud. Zapovednik.]

The body temperature of the elk varies with the time of day and particularly with the season of the year; the temperature variations are directly related to the temperature of the surroundings. In winter the elk is capable of maintaining its normal functions at a lower body temperature than in the summer. During hard frost movement is reduced to a minimum and the elk usually lies down. In the summer the sun's heat leads to a rapid rise in body temperature which reduces the

elk's working capacity. The elk must be trained before it is of much use for work; nervous types are not good for training, since they are easily excited; this leads to rise of body temperature and reduces the working efficiency. (From auth summary.)—W. Hughes.

666

- HORVATH, S. M., HUTT, B. K., SPURR, G. B. and STEVENS, G. E. **Some metabolic responses of dogs having low body temperature.** *Science*, 1953, **118**, 100-101. [Dept. Physiol., Coll. Med., State Univ. Iowa, Iowa City.]

After preliminary anaesthetisation with Nembutal to prevent shivering it was possible to expose dogs to room temperatures low enough to reduce the rectal temperature and to maintain it at about $24^{\circ} \pm 1^{\circ}$ C. for as long as 28 hr. with subsequent recovery. Metabolic data are given for 2 of these dogs and are similar for both.

In dog A the rectal temperature was at $23.6^{\circ} \pm 1.5^{\circ}$ C. for 28 hr. The mean body temperature was 22.7° C. Heart rate fell from 84 to 36 beats per min., O_2 consumption from 96 to 17 ml. per min., respiratory rate from 8 to 2 per min. Heat production fell from 34.7 to 6.2 Cal. per sq. m. per hr., and averaged 11.3 Cal. per sq. m. per hr. for the last 27 hr. of exposure.

In 18 experiments on 11 dogs the reduction in heat production and the fall in rectal temperature were exponentially related, and application of van't Hoff's law to warm-blooded organisms within this temperature range would appear to be valid.—D. Duncan.

667

- MAYER, J. and GREENBERG, R. M. **Hyperthermia in hypothalamic hyperphagia.** *Amer. J. Physiol.*, 1953, **173**, 523-525. [Dept. Nutrit., Harvard Sch. Pub. Health, Boston, Mass.]

Production of hypothalamic lesions and subsequent increase of appetite are described in Abst. 746, Vol. 23. Rats weighing 350 to 550 g. were considered to be overeating. Such animals had colonic temperatures of $37.45 \pm 0.33^{\circ}$ C., compared with intact controls, $36.78 \pm 0.3^{\circ}$ C. Fasting for 2 or 6 hr. did not eliminate the difference. In rats recently operated on which were not obese the temperature was consistently high, even when they were not gaining weight. Exposure to heat, 40.0° C., or to cold, 3.5° C., showed that affected rats had no gross impairment of heat regulation. The significance of the results is discussed.

D. Duncan.

668

- HALBERG, F. and VISSCHER, M. B. **A difference between the effects of dietary calorie restriction on the estrous cycle and on the 24-hour adrenal**

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cortical cycle in rodents. *Endocrinology*, 1952, **51**, 329-335. [Dept. Physiol., Univ. Minnesota, Minneapolis.]

Female C₃H mice were singly housed from weaning in metal cages with temperature and illumination controlled. The control group of 28 mice each received 2.66 g. food daily and 17 mice in the restricted group 1.51 g. daily, the reduction being made in carbohydrates and fats only. At 6 months of age the average weight of control mice was 29 g. and of restricted mice 18 g. The amplitude of the diurnal eosinophil rhythm, when tested statistically, was slightly greater in the restricted than in the control group.

The uteri of the control group, at 195.6 ± 23 per 100,000 of bodyweight, were heavier than those of the restricted group at 39.8 ± 1.4 . The adrenal glands did not differ significantly in weight.

It is concluded that the 24-hr. adrenal cortical cycle is not suppressed in conditions known to suppress the oestrous cycle.—A. Iggo.

669

HUTCHINSON, J. C. D. and SYKES, A. H. **Physiological acclimatization of fowls to a hot humid environment.** *J. Agric. Sci.*, 1953, **43**, 294-322. [Agric. Res. Coun. Poultry Centre, King's Bldgs., Edinburgh.]

In tests with inbred Brown Leghorns, 3 cocks and 3 hens in each group, acclimatisation to tropical climates was investigated. The birds were maintained on an adequate diet and exposed to temperatures of 99°, 102° or 104° F. for 4 hr. daily or continuously for 21 days, without ill

effect on egg production, feed intake or liveweight. Short daily periods in the hot climate increased heat tolerance as indicated by rectal temperature, 102° F. air temperature producing the same heat stress in acclimatised birds as 99° F. in unacclimatised. Continuous residence in the hot climate further improved heat tolerance. Cocks were more tolerant than hens. Evaporative loss was reduced by acclimatisation, but respiratory rate was not significantly affected. In severe heat stress, when rectal temperature was about 110° F., there was an increase in heart rate, less when the birds had been acclimatised.—T. D. Bell.

670

HUTCHINSON, J. C. D. **Effect of hot climates on egg weight.** *Poultry Sci.*, 1953, **32**, 692-696. [Poultry Res. Centre, Kings Bldgs., Edinburgh.]

Two groups of 3 pullets were exposed for up to 4 hr. daily on 6 days a week, for about 6 weeks, in a climatic chamber. In the first 24 exposures the temperature was 99° F. and humidity 28 mm. Hg vapour pressure. In the last 5 or 6 exposures the temperature was higher. Between exposures the birds were kept in an environment at or below 60° F. After this intermittent acclimatisation they were kept continuously at about 85° F. for 3 weeks and then at 90° F. for 4 weeks.

Egg weight was reduced during the intermittent exposures to heat, but increased, though not to control level, in continuous exposure at somewhat lower temperatures.—M. J. Head.

See also Absts. 375, 449, 651, 913.

CARBOHYDRATES

671

ISEBELL, H. S. and FRUSH, H. L. **Chemistry of the carbohydrates.** *Annu. Rev. Biochem.*, 1953, **22**, 107-124. [Nat. Bur. Standards, Washington, D.C.]

672

LELOIR, L. F. and CARDINI, C. E. **Carbohydrate metabolism.** *Annu. Rev. Biochem.*, 1953, **22**, 179-210. [Inst. Invest. Bioquím., Fund. Campomar, Buenos Aires.]

673

The major metabolic fuels. *Brookhaven Symposia in Biology* No. 5, September 1952, pp. vii + 234.

674

DICKENS, F. **Alternative routes of carbohydrate oxidation.** *Brit. Med. Bull.*, 1953, **9**, 105-109. [Dept. Exp. Biochem., Middlesex Hosp. Med. Sch., London.]

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675

WARD, O. C. **Blood sugar studies on premature babies.** *Arch. Dis. Childhood*, 1953, **28**, 194-197. [Dept. Child Health, Alder Hey Child. Hosp., Liverpool.]

In 21 infants who weighed $5\frac{1}{2}$ lb. (2500 g.) or less at birth, blood sugar was estimated at 6-hr. intervals for the first 48 hr. Only 4 babies received any feed during this time. The cord blood sugar ranged from 40 to 140 mg. [presumably per 100 ml., although this is not stated], mean 66, and the postnatal levels from 16 to 90 mg. per 100 ml. The mean value on the first day of life was 44 and on the second day 45. As others have found, no relation between blood sugar and birthweight could be demonstrated.—M. S. Fraser.

676

ADDISON, V. E., TUTTLE, W. W., DAUM, K. and LARSEN, R. **Effect of amount and type of protein in breakfasts on blood sugar levels.**

J. Amer. Dietetic Assoc., 1953, **29**, 674-677. [Dept. Physiol., Coll. Med., State Univ. Iowa, Iowa City.]

Earlier work (Abst. 4542, Vol. 23) had shown that a breakfast containing 25 g. protein would maintain blood sugar for $3\frac{1}{2}$ hr. at a level above fasting. The present studies were on 14 normal women who ate each of 2 breakfasts containing 15 g. protein, in one mainly of animal and in the other mainly of vegetable origin. Each breakfast maintained blood sugar above fasting level for about 2 hr., after which it fell below this level, but not by significant amounts. It is concluded that, irrespective of its source, 15 g. protein is the amount required in a breakfast to maintain blood sugar during late morning hours at a level not significantly different from fasting.—D. Harvey.

677

GRANDE, F. and DE OYA, J. C. Algunas observaciones sobre las pruebas de sobrecarga de glucosa por via intravenosa. [Studies of glucose tolerance tests by intravenous injection.] *Rev. clin. española*, 1953, **50**, 79-83. [Inst. Invest. Méd., Univ. Madrid.] English, German and French summaries.

The rate of disappearance of sugar from the blood is an exponential function of concentration in the blood.—I. Leitch.

678

HELSKE, E. Glucose tolerance test in patients with peptic ulcer. *Ann. Med. int. Fenn.*, 1953, **42**, 89-95. [I. Med. Clin., Univ. Helsinki.]

In 22 patients with duodenal and 17 with gastric ulcer the blood sugar curves after a test dose of 1 g. glucose per kg. bodyweight all fell within the normal range. The contradictory results reported in the literature are discussed.—L. Wills.

679

KIBLER, R. F. and MYERS, J. D. Further studies on the hyperglycemia factor of the pancreas. *Amer. J. Med.*, 1953, **14**, 753. *Proc.* [Dept. Med., Sch. Med., Duke Univ., Durham, N.C.]

680

HANSEN, R. G., CRAINE, E. M. and KRICHEVSKY, P. The conversion of glucose to galactose. *J. Dairy Sci.*, 1953, **36**, 590. *Proc.* [Univ. Illinois, Urbana.]

681

HARTMANN, A. F., GRUNWALDT, E. and JAMES, D. H. (Jr.) (with MORTON, M. K.) Blood galactose in infants and children. *J. Pediat.*, 1953, **43**, 1-8. [Dept. Paediat., Sch. Med., Washington Univ., St. Louis, Mo.]

682

BING, R. J., TAESCHLER, M., SIEGEL, A., VITALE, A. and BALBONI, F. Metabolic studies on the human heart *in vivo*. *Amer. J. Med.*, 1953, **14**, 746. *Proc.* [Dept. Med., Med. Coll. Alabama, Birmingham.]

A study of glucose, pyruvate and lactate.

683

ALSLEV, J. Vergleichende Untersuchungen über den intermediären Galaktose- und Dextrosestoffwechsel bei Gesunden und Leberkranken. [Comparative studies of intermediary metabolism of galactose and glucose in healthy persons and patients with liver disorders.] *Ztschr. ges. exp. Med.*, 1953, **121**, 1-11. [Med. Klin., Univ. Kiel.]

After taking glucose or galactose the blood sugar curves in patients with liver cirrhosis rose higher than in normal persons and the added sugars disappeared more slowly from the circulation. Blood lactic acid and pyruvic acid rose more sharply in normal persons than in those with liver disorders, especially after galactose, reaching a peak after 60 min. and returning to normal by 210 min. In liver cirrhosis the fasting values for blood lactic acid and pyruvic acid were higher than in normal persons, but after glucose or galactose the curves rose more slowly and the rise was increased or maintained up to 210 min. Similar, but less marked, deviations were found in patients with icteric hepatitis. The results are discussed from the biochemical standpoint in relation to previous findings.—M. B. Richards.

684

HEIN-SEKULA, M. and SIEDEK, H. Ueber den Einfluss von ACTH und Cortison auf den Galaktosestoffwechsel. [Influence of adrenocorticotrophic hormone and cortisone on galactose metabolism.] *Wien. klin. Wochenschr.*, 1953, **65**, 572-574. [I. Med. Klin., Univ. Vienna.]

Studies were made on 30 subjects of the effects of cortisone and adrenocorticotrophic hormone on the response to intravenous injection of 20 g. galactose in the fasting state. Both hormones increased the amount of galactose excreted in the urine and decreased the concentration of it in the blood. During the first 2 hr. after the injection of galactose and either hormone there was some increase in the amounts of sugar, lactic acid and pyruvic acid in the blood. The results are discussed with reference to similar studies by the authors with fructose (*Wien. klin. Wochenschr.*, 1952, **64**, 391) and to other observations reported in the literature on the role of cortical hormones in carbohydrate metabolism.—A. M. Copping.

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685

HERS, H. G. and KUSAKA, T. Le metabolisme du fructose-1-phosphate dans le foie. [Metabolism of fructose-1-phosphate in the liver.] *Biochim. biophys. Acta*, 1953, **11**, 427-437. [Lab. Chim. Physiol., Univ. Louvain.] English and German summaries.

686

JORDE, W. O. Beitrag zum Laevulose- und Kreatinstoffwechsel. [The metabolism of fructose and creatine.] *Ztschr. ges. exp. Med.*, 1953, **121**, 170-180. [I. Med. Klin., Univ. Munich.]

After injections of 0.25 g. fructose per kg. body-weight, patients with hepatitis showed in the first 30 min. no significant difference from normal subjects in the total reducing power or fructose content of the blood. In normal subjects the fructose disappeared completely from the blood within 30 min., but in patients with hepatitis it persisted for between 60 and 120 min., except in one patient with cirrhosis, in whom fructose was still present after 2 hr. Blood lactic acid showed no increase in normal subjects within 15 min. after injection of fructose. Fasting blood lactic acid was low in those with liver disorders and in 2 subjects with healthy livers but much reduced bodyweight. In patients with hepatitis it showed a significant increase from its low initial value but did not reach the normal. Repeated administration of fructose tended to increase the values. Injections of creatine and creatine phosphate had no effect on blood sugar and lactic acid curves after administration of fructose.—M. B. Richards.

687

MACKLER, B. and GUEST, G. M. Effects of acidosis on the metabolism of fructose. *Amer. J. Physiol.*, 1953, **174**, 54-56. [Child. Hosp. Res. Found., Univ. Cincinnati, Ohio.]

Intravenous fructose tolerance tests on 3 dogs in the normal fasting state and in acidosis induced by continuous intravenous perfusion of ammonium chloride solutions showed that the rates of disappearance of fructose from the blood were the same. In 6 experiments on blood with fructose added *in vitro*, little or no fructose disappeared from the blood until the concentration of glucose reached a low level. Thereafter the rate of disappearance of fructose reached a maximum and then decreased logarithmically. Comparison of fructose breakdown in blood showed that the rate of fructose disappearance was slower in the acidotic than in the control sample. The results indicate that fructokinase is probably absent from blood and that acidosis inhibits the utilisation of fructose by blood cells.—M. B. Richards.

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688

CRAIG, J. W., DRUCKER, W. R., MILLER, M., OWENS, J. E., BROFMAN, B., PRITCHARD, W. H. and WOODWARD, H. Metabolism of fructose in the liver of normal and diabetic subjects. *Amer. J. Med.*, 1952, **12**, 610. *Proc.* [Cleveland, Ohio.]
See Abst. 2306, Vol. 22.

689

MILLER, M., MURPHY, J. R., CRAIG, J. W. and WOODWARD, H. Studies in experimental diabetic acidosis: comparison of the effect of fructose and glucose in the initial hours of treatment. *J. Clin. Endocrinol.*, 1953, **13**, 866. *Proc.* [Dept. Med., W. Reserve Univ., Cleveland, Ohio.]

690

PANSINI, R. and CASAULA, A. L'effetto del carico glicidico sull'acido piruvico arterioso e venoso, alla luce del fenomeno della variabilità piruvicemica spontanea, nei soggetti sani. [The effect of giving glucose on the amount of pyruvic acid in the arterial and venous blood, in the light of the spontaneous variation in the pyruvic acid content of the blood of healthy persons.] *Boll. Soc. ital. Biol. sper.*, 1952, **28**, 1783-1787. [Ist. Patol. Med., Univ. Bari.]

Pyruvic acid and sugar were estimated in the blood of 17 fasting, resting subjects before and at intervals of up to 2 hr. after administration by mouth of 0.75 g. glucose per kg. bodyweight. Blood sugar increased in all subjects in both venous and arterial blood. The individual values for pyruvic acid varied widely, but were raised, usually only to a moderate extent, in the arterial blood of 13 subjects and in the venous blood of 14. The increase in the venous blood was usually the greater.—E. M. Hume.

691

ALSLEV, J. and MÖCKEL, W. Über den Einfluss der Brenztraubensäure und Milchsäure auf die Alkalireserve. [Influence of pyruvic acid and lactic acid on the alkali reserve.] *Klin. Wochenschr.*, 1953, **31**, 561-564. [Med. Klin., Univ. Kiel.]

The effect on the lactic and pyruvic acid in the blood and on the alkali reserve of giving glucose or galactose was examined in 8 healthy and 16 diabetic subjects. In normal subjects intake of glucose or galactose in the fasting state caused a slight increase in pyruvic acid and a moderate increase in lactic acid, with a decrease in the alkali reserve. The effect was more marked with galactose than with glucose, the alkali reserve being reduced by 5.7 vol. per cent. as measured by Van

Slyke's method. The effect of galactose was of the same order in diabetic subjects though the rise in lactic acid was greater and the decrease in alkali reserve was by 6.6 vol. per cent. There was no increase in acetone bodies and the fall in alkali reserve was much less than the severe depletion observed in diabetic coma.—A. M. Copping.

692

GLÜCKSMAN, J. and FIŠEROVÁ, V. Kyselina pyrohroznová v moči. [**Pyruvic acid in the urine.**] *Čas. Lék. čes.*, 1953, **92**, 669–675. [Inst. Physiol., Prague.] Russian summary.

693

BROX, G. Beiträge zum Glukuronsäurestoffwechsel. 2. Zur Pathologie. Die Glukuronsäureausscheidung beim Diabetes mellitus. [**Glucuronic acid metabolism. 2. Pathology. Excretion of glucuronic acid in diabetes mellitus.**] 3. Zur Pathologie. Die Glukuronsäureausscheidung bei Lebererkrankungen. [**3. Pathology. Excretion of glucuronic acid in liver disease.**] *Deutsch. Ztschr. Verdauungs- u. Stoffwechselkr.*, 1953, **13**, 193–197; 198–202. [Med. Klin., Univ. Leipzig.]

694

KRIVIT, W., POLGLASE, W. J., GUNN, F. D. and TYLER, F. H. Studies in disorders of muscle. 9. Glycogen storage disease primarily affecting skeletal muscle and clinically resembling amyotonia congenita. *Pediatrics*, 1953, **12**, 165–177. [Dept. Med., Sch. Med., Univ. Utah, Salt Lake City.] Spanish summary.

A detailed description is given of the clinical, biochemical and pathological findings in 3 siblings under the age of 2 years. The basic lesion in all three was an excessive storage of glycogen in the skeletal muscles. During life the condition could be distinguished from *amyotonia congenita* only by muscle biopsy. There was no marked enlargement of the liver, hypoglycaemia or ketosis, but muscle weakness was present and the age of onset and time of death were early. The glycogen content of the liver was much less than in the hepatomegalic type and that of the muscles much greater. Glycogen isolated from both biopsy and post-mortem material from 1 patient showed by physicochemical analysis that post-mortem glycogen breakdown occurred to some extent, in contrast to the hepatomegalic type, and that the glycogen from this patient had a low average chain length and showed excessive branching as compared with normal glycogen. There was also an increase in a low molecular weight component of muscle glycogen from the patient as compared with normal muscle glycogen.—L. Wills.

695

LARSEN, H. J. and STODDARD, G. E. Changes in blood reducing sugar levels following administration of carbohydrates directly into the omasal-abomasal cavity of dairy calves. *J. Dairy Sci.*, 1953, **36**, 601. *Proc.* [Iowa State Coll., Ames.]

696

TRIBE, D. E. and GORDON, J. G. Effect of different starches on the choice of diet by rats. *Brit. J. Nutrition*, 1953, **7**, 202–207. [Rowett Res. Inst., Bucksburn, Aberdeenshire.]

Four diets were used with the following basal composition: vitamin-free casein 230, glucose 330, margarine 150, salts 50, raw unground starch 400 g. and Radiostoleum 4 ml. Diet 1 contained potato starch, diet 2 rice starch, diet 3 maize starch. Diet 4 contained maize starch and was supplemented with vitamins of the B complex. Each of 4 groups of 6 young rats was offered a choice of 2 diets.

Diet 3 was consumed in larger amounts than diet 1 by all except 1 rat; all 6 rats died. Diets 2 and 3 were consumed in equal amounts; all the rats died. Diet 4 was chosen in preference to diet 1 or diet 2. The rat which preferred the potato starch to the maize starch diet was given ground potato starch after 33 days, whereupon it ceased to eat the potato starch diet until unground potato starch was restored. A rat which preferred the maize starch diet to the potato starch for 36 days changed to the potato starch diet when ground potato starch replaced unground in the optional diet.

F. C. Aitken.

697

BO, W. J. and ATKINSON, W. B. Histochemical studies on glycogen deposition in uterus of the rat. 3. Effect of starvation. *Proc. Soc. Exp. Biol. Med.*, 1953, **83**, 405–407. [Dept. Anat., Coll. Med., Univ. Cincinnati, Ohio.]

Despite the depletion of glycogen in liver and skeletal muscle of starved rats from which the pituitary or the ovaries or both had been removed, injection of 20 µg. oestradiol propionate into such animals promoted the deposition of glycogen in the uterine musculature, in amounts comparable to those deposited in well nourished animals which had been similarly operated upon.—W. Godden.

698

GEIGER, E. and WICK, A. N. Nitrogen sparing effect of carbohydrate investigated by feeding of C¹⁴ labeled glucose. *Arch. exp. Pathol. Pharmacol.*, 1953, **219**, 518–527. [Dept. Pharmacol., Univ. S. California, Los Angeles.]

The amino-acid mixture used consisted of valine 1.1, leucine 1.2, isoleucine 0.75, methionine (racemic) 1.0, threonine 0.75, phenylalanine

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(racemic) 1.05, tryptophan 0.3, lysine HCl 1.9, histidine HCl. H_2O 0.9, arginine HCl 0.4, $NaHCO_3$ 1.3 parts by weight. In all experiments the rats received 500 mg. of the mixture by stomach tube. The glucose used was labelled with ^{14}C and 1 g. was given in solution by stomach tube, with 100 mg. $NH_4H_2PO_4$.

In experiment 1, 12 rats received a protein-free diet for 14 days; 6 then received the amino-acid mixture and the labelled sugar solution simultaneously and 6 received the sugar 4 hr. after the amino-acids. All were killed 8 hr. after receiving the amino-acids. The distribution of ^{14}C in the carcasses was similar in both groups.

About 75 per cent. of the liver was removed in the next experiment, and the rats were given the protein-free diet for 48 hr. before administration of amino-acids and sugar, together or separately as before. ^{14}C uptake by the regenerating liver protein was higher when the substances were given together or when glucose was given first than when glucose was given later. In another experiment glucose was given alone and ^{14}C uptake by liver protein was yet higher.

^{14}C was incorporated in significant amounts into 6 liver amino-acids, in descending order arginine, alanine, glutamic acid, aspartic acid, glycine and serine. The essential amino-acids showed no ^{14}C uptake.—D. Duncan.

699

PATTERSON, J. W. **Cataracts caused by carbohydrates.** *Amer. J. Ophthalmol.*, 1953, **36**, No. 6, Part 2, 143-147 (with discussion 147-149). *Proc.* [Sch. Med., W. Reserve Univ., Cleveland, Ohio.]

700

RUTTER, W. J., KRICHEVSKY, P., SCOTT, H. M. and HANSEN, R. G. **The metabolism of**

lactose and galactose in the chick. *Poultry Sci.*, 1953, **32**, 706-715. [Dept. Dairy Sci., Univ. Illinois, Urbana.]

Day-old chicks received in experiments 1 to 3 a basal diet of the maize and soya bean type; the supplements in experiment 1 were 53.45 per cent. dextrin, lactose, maltose, sucrose or glucose given at the expense of maize. The birds receiving lactose grew least and a significant number developed toe abnormalities; the other groups grew normally. In experiment 2, the diet was given alone, or with 53.45 or 40 per cent. lactose, or 40 per cent. lactose plus 13.45 per cent. ground wheat, ground oats or dried baker's yeast; the average group liveweights were 255, 138, 217, 223, 203 and 167 g., respectively, at 21 days of age. In experiment 3, 10, 20, 40 per cent. lactose and 40 per cent. lactose plus 20 per cent. beet pulp were given at the expense of maize; the 2 lower lactose intakes had no effect on liveweight, although feed efficiency was much lower at the 20 per cent. lactose level. Diarrhoea was troublesome when more than 10 per cent. lactose was given.

The basal diet for experiments 4 to 6 was based on cerelese and casein, the supplements being at the expense of cerelese. In 2 experiments more than 10 per cent. lactose or galactose decreased growth. Curled toe occurred only in groups receiving lactose, but epileptiform convulsions were recorded in chicks receiving more than 10 per cent. galactose for more than 4 or 5 days. Blood reducing sugar was 460 to 470 mg. per 100 ml. at galactose intakes of 15 and 20 per cent. Giving 0.1 per cent. uridine or uracil or 0.01 per cent. vitamin B_{12} , together or separately, did not alleviate the signs and no effect was seen when these substances were injected intravenously.

M. J. Head.

See also Absts. 403, 428, 533-35, 546, 639, 736, 740, 882, 1099.

PROTEINS AND PROTEIN DERIVATIVES

701

FROMAGEOT, C. and JUTISZ, M. **Chemistry of amino acids, peptides, and proteins.** *Annu. Rev. Biochem.*, 1953, **22**, 629-678. [Lab. Chim. Biol., Fac. Sci., Paris.]

702

MÜLLER, E. and NIKLAS, A. **Neuere Untersuchungen zum Kohlenhydrat-, Fett- und Eiweiss-stoffwechsel unter besonderer Berücksichtigung der Arbeiten mit radioaktiven und stabilen Isotopen. 3. Eiweiss-stoffwechsel. [New studies of carbohydrate, fat and protein metabolism with special reference to work with radio-active and stable isotopes. 3. Protein**

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metabolism.] *Deutsch. Ztschr. Verdauungs- u. Stoffwechseler.*, 1953, **13**, 160-181. [Med. Klin., Univ. Cologne.]

A review.

703

CHRISTENSEN, H. N. **Metabolism of amino acids and proteins.** *Annu. Rev. Biochem.*, 1953, **22**, 233-260. [Med. Sch., Tufts Coll., Boston, Mass.]

704

JACQUOT, R. **La synthèse protéique. [Protein synthesis.]** *Biol. méd.*, 1953, **42**, 328-381. [Lab. Biochim. Nutrit., C.N.R.S.]

See Abst. 3260, Vol. 22.

705

ASKONAS, B. A. and CAMPBELL, P. N. **Bio-synthesis of milk proteins in the fasting goat.** *Biochim. biophys. Acta.* 1953, **11**, 304-305. [Nat. Inst. Med. Res., Mill Hill, London, N.W.7.]

Methionine labelled with ^{35}S was injected intravenously into a lactating goat on a normal diet and after a 48-hr. fast; samples of milk were taken at short intervals and the activities of the protein fractions were measured.

The activity of casein and whey proteins greatly exceeded that of plasma proteins, suggesting that the mechanism of formation of milk proteins was the same in the normal and the fasting goat and that the blood proteins were not major precursors of the milk proteins. In the normal animal, the maximum activity of the milk proteins occurred $1\frac{3}{4}$ hr., but after fasting, at $4\frac{1}{2}$ hr. after the injection, the difference being due possibly to the considerable reduction of milk output in the fasting condition.—C. Warner.

706

REBER, E. F., WHITEHAIR, C. K. and MACVICAR, R. **The effect of level of protein fed baby pigs.** *J. Nutrition*, 1953, **50**, 451-458. [Oklahoma Agric. Exp. Stat., Stillwater.]

The 5 experimental rations were compounded of casein, lard, lactose and salts so as to have protein contents of 15, 20, 25, 33 and 41 per cent., made up with water into synthetic milks with an energy value of 1190 Cal. per litre, and supplemented with vitamins. In each of 2 experiments 6 littermate baby pigs were used to test 3 of the 5 rations. In the first 12 days a pair were given one of 3 levels of protein, in the following 12 days a pig of each pair was given one of the remaining 2 protein levels and in the next 12 days each pig received the protein level it had not previously been given. The first 3 protein levels were tested in the first experiment, the last 3 in the second experiment. All animals were given isocaloric amounts of the ration at each feed.

With increasing protein content of ration the dry matter required per kg. weight gain decreased, N retention increased, plasma tryptophan increased, and biological value of casein decreased, especially in younger pigs. Plasma protein, Hb and blood nicotinic acid were not significantly affected by protein intake. Efficiency of conversion of dry matter to bodyweight was negatively correlated with age. The ration containing 41 per cent. protein produced maximum weight gain and feed efficiency in very young pigs. As pigs approached 8 weeks of age protein at the 20 per cent. level was used almost as efficiently as at higher levels.—F. C. Aitken.

707

EGGERT, R. G., BRINEGAR, M. J. and ANDERSON, C. R. **Delayed protein supplementation of corn diets for growing swine.** *J. Nutrition*, 1953, **50**, 469-477. [Dept. Animal Husb., Coll. Agric., Univ. Nebraska, Lincoln.]

Groups of 4 weanling pigs were weighed weekly and feed intakes were adjusted to 4.5 or 5.0 per cent. of bodyweight. All were fed twice daily. In one experiment one group was given the protein supplement at both feeds of maize, the other was given all the protein supplement at the morning feed of maize. In the second experiment the interval between maize and protein supplement was lengthened to 36 hr. In the third experiment 4 methods of feeding were compared, maize with supplement, and maize and supplement separated by intervals of 24, 36 and 48 hr. Two replicates of 4 pigs each were used, each replicate forming a separate 4×4 Latin square.

An interval of 24 hr. between supplement and maize did not significantly affect N retention or weight gain. Intervals of 36 and 48 hr. significantly depressed weight gain and reduced N retention by 7 and 14 per cent., respectively. As measured by least significant difference the 14 per cent. reduction was significant, but not the 7 per cent.

The protein supplements used were designed to correct the lysine and tryptophan deficiencies of maize. Protein supplement and maize together gave a diet containing 16 or 17 per cent. protein. F. C. Aitken.

708

EVERSON, T. C. (with HOPPE, E.) **An experimental evaluation of the effectiveness of Tween 80 in reducing fecal nitrogen and fat loss following subtotal and total gastrectomy.** *Surgery*, 1953, **34**, 33-37. [Dept. Surg., Univ. Illinois Coll. Med., Chicago.]

In controlled experiments on dogs subjected to either partial or complete gastrectomy no significant reduction was found in the faecal excretion of fat or N after administration of Tween 80 in therapeutic doses.—L. Wills.

709

MORIMOTO, H. and HAYASHI, Y. **[Studies on the estimation of nutritive value of protein by components of organs. 1.]** *Bull. Nat. Inst. Agric. Sci., Chiba [G]*, 1953, No. 6, 131-138. In Japanese: English summary.

Rats were fed for a preliminary period on a control diet, fasted for 4 to 7 days and then fed for 8 to 12 days on diets containing fishmeal, wheat bran, soya bean meal, egg powder or cheese. Changes in body weight and weight and N content of liver, kidney, seminal vesicles, testicles and heart were noted. After fasting the N content of

the liver decreased markedly, that of the kidney and seminal vesicles to a less extent; that of the testicles and heart remained the same. The increase in N content of the liver after protein feeding varied according to the kind of protein, but it was difficult to assess nutritive value by this variation. (From summary.)—J. S. Thomson.

710

HARPER, A. E., MONSON, W. J., BENTON, D. A. and ELVEHJEM, C. A. **The influence of protein and certain amino acids, particularly threonine, on the deposition of fat in the liver of the rat.** *J. Nutrition*, 1953, **50**, 383-393. [Dept. Biochem., Univ. Wisconsin, Madison.]

Rats received a basal diet containing 9 per cent. casein, 0.3 per cent. methionine, 0.13 per cent. choline, sucrose, fats, minerals and vitamins, and nitrogen compounds were tested for effect on growth rate and fat deposition in the liver over periods of from 2 to 5 weeks. An additional 2 per cent. of casein, or a mixture of essential amino-acids, nearly doubled growth rate and nearly halved liver fat content; 6 per cent. of gelatine, or certain mixtures of non-essential amino-acids, had a similar effect on liver fat without affecting growth; 0.1 per cent. of tryptophan increased growth rate without affecting liver fat content and was added to the basal ration in some experiments. The most effective supplement found for reducing liver fat was a mixture of 0.18 per cent. threonine and 1.5 per cent. glycine; threonine alone was better than glycine alone, but neither was as effective as both together. The effect of threonine was slight if choline was omitted from the basal ration.

Glycocyamine with betaine, serine, glycocyamine alone and additional choline and methionine, in that order, had decreasing effects on the liver fat content. Arginine, proline, creatine, ammonium citrate, and combinations of these, had no effect. The accumulation of liver fat caused by the basal diet could be reversed by gelatine. No satisfactory explanation of all these effects is proposed.

C. Warner.

711

PROTASOVA, T. N. Vliyanie kortina i dezoksi-kortikosterona na vosstanovlenie nekotorykh protsessov azotistogo obmena, narushennykh pri belkovo nedostatochnosti. [The effect of cortin and deoxycorticosterone on the restoration of certain processes of nitrogen metabolism interrupted by protein deficiency.] *Biokhimiya*, 1953, **18**, 89-96. [Lab. Khim. Org., Inst. Biol. Med. Khim., Akad. Med. Nauk SSSR, Moscow.]

When deoxycorticosterone or cortin was subcutaneously injected into white rats with obvious signs of protein deficiency there was a decrease in urine N, an increase in the percentage of urea

relative to total N and a decrease in excretion of amino-acids. The hormones also increased the activity of the enzymes deaminising *dl*-alanine and those oxidising tyrosine and led to increased urea formation in liver slices from protein-deficient animals.

When the test animals were repleted cortin and deoxycorticosterone considerably speeded up complete restoration of these functions. Simultaneous injection of adrenal and thyroid hormones enhanced their effects.—W. Hughes.

712

CAMPBELL, R. M., SHARP, G., BOYNE, A. W. and CUTHBERTSON, D. P. **Cortisone and the metabolic response to injury.** *Nature*, 1953, **172**, 158-160. [Rowett Res. Inst., Bucksburn, Aberdeenshire.]

Male rats at about 3 months of age were divided into 4 groups for the following treatments: (1) subcutaneous implantation of 25 mg. cortisone acetate; (2) fracture of femur by open operation; (3) subcutaneous implantation of 50 mg. cortisone acetate; (4) treatments 1 and 2 combined. The increased output of urinary N over the pre-treatment level was similar in groups 1 and 2 and in groups 3 and 4, but the increase in groups 3 and 4 was less than twice that in groups 1 and 2. The magnitude of the responses was apparently conditioned by the amount of hormone implanted and by the presence or absence of injury. The significance of the results is discussed.

D. Duncan.

713

BENDER, A. E., MILLER, D. S. and TUNNAH, E. J. **The biological value of gelatin.** *Chem. and Indust.*, 1953, No. 30, 799. [Crookes Laboratories, Ltd., Park Royal, London, N.W.10.]

From estimations of the net protein utilisation of commercial gelatine, with or without 10 per cent. of yeast extract, by the carcass N method, it is concluded that the biological value of gelatine for rats is nil, and not 25, as claimed by Mitchell and Block (Abst. 1917, Vol. 16) and others.

D. Duncan.

714

BENDER, A. E., MILLER, D. S. and TUNNAH, E. J. **The biological value of fish meals.** *Proc. Nutrit. Soc.*, 1953, **12**, ii. [Crookes Laboratories, Ltd., Park Royal, London, N.W.10.]

715

HALEVY, S. and GUGGENHEIM, K. **The biological availability of heated wheat gluten-glucose mixtures.** *Arch. Biochem. Biophys.*, 1953, **44**, 211-217. [Lab. Nutrit., Hadassah Med. Sch., Hebrew Univ., Jerusalem.]

Gluten mixed with water, 0.5 ml. per g., or with water and 1 g. glucose per g. pure protein ($N \times 6.25$), was autoclaved at 120° C. for 2 hr. The effect of heat on the biological value of the protein was measured by estimation of the amino-acids liberated by acid hydrolysis or by digestion with pancreatin for up to 120 hr. The results showed liberation of 83 per cent. less arginine, 50 per cent. less lysine and 7 per cent. less phenylalanine after heating the gluten with glucose than after heating it alone. The other 7 amino-acids were not affected. The results confirm the earlier work of Clandinin *et al.* (Abst. 2260, Vol. 21).

N balance studies with rats, the test proteins forming 9 per cent. of the diet, showed a reduction of digestibility and a very great reduction of biological value of the autoclaved gluten-glucose mixture as compared with the autoclaved gluten. Addition of lysine, alone or with arginine, to the autoclaved mixture restored its biological value to that of gluten autoclaved alone.—W. Godden.

716

SCHROEDER, L. J., IACOBELLIS, M., LEES, H. and SMITH, A. H. **The effect of heat on the nutritive value of milk proteins as influenced by water and fat.** *J. Nutrition*, 1953, 50, 351–360. [Dept. Physiol. Chem., Coll. Med., Wayne Univ., Detroit.]

Dogs received rations containing 10 per cent. protein provided entirely by a dried skimmed milk powder containing 35 per cent. protein. When the dry powder was autoclaved at 15 lb. pressure for 30 min. N balance was negative and digestibility and biological value were reduced, but when the milk powder was reconstituted with water to protein levels of 3.5 or 17.5 per cent. before autoclaving, no change in N balance, digestibility or biological value, as compared with unheated powder, was found.

In tests *in vitro* with whole milk and skimmed milk powders heated in different ways, the amount of amino-N released by crystalline trypsin or chymotrypsin was estimated. Roughly 3 times as much amino-N was liberated by these enzymes from the autoclaved skimmed milk powder if it had been reconstituted at levels of 3.5, 10.5, 17.5 or 24.5 per cent. protein before heating; little water was thus needed to protect the protein against heat injury. The digestibility of the proteins of reconstituted milk *in vitro* was improved by heat treatment. Similar results were obtained with whole milk powder; there may have been slight additional protection of the protein by the fat present.—C. Warner.

717

FINK, H., SCHLIE, I. and RUGE, U. **Über die Zusammensetzung, die Verdaulichkeit und die**

Eiweiss-Qualität des Mycels von *Penicillium notatum*. Ein Beitrag zur Verwertung der Pilzabfälle bei der Penicillin-Gewinnung. [Composition, digestibility and protein quality of the mycelium of *Penicillium notatum*; a contribution to the utilisation of mould residues from the production of penicillin.] *Hoppe-Seyler's Ztschr.*, 1953, 292, 251–263. [Ernährungsphysiol. Abt., Inst. Gärungswiss., Univ. Cologne.]

Seven samples of mycelium of *Penicillium notatum*, residues from penicillin factories, gave on analysis a crude protein content of 27 to 31 per cent. of the dry matter and an ash content of 28 to 34 per cent. A complete ash analysis of one sample showed P_2O_5 32.5 and CaO 21.18 per cent. Studies of 2 samples of mycelium *in vitro*, with solutions of pepsin, trypsin and diastase, gave 44 and 48 per cent. digestibility for dry matter and 77 and 69 per cent. for crude protein. Estimations on adult rats *in vivo* gave 50 and 51 per cent. digestibility for dry matter, and 59 and 58 per cent. for crude protein.

The biological quality of the protein was tested on young rats in experiments lasting 90 to 120 days, preliminary tests having shown that the mycelium would be eaten by rats without injurious effect. The diet contained 32.4 per cent. dried mycelium, which supplied 77 per cent. of the protein intake. The biological value of the protein, average 59.8 per cent., was inferior to that of milk protein, but similar to that of other plant proteins. It was approximately equal to that of *Torula utilis* or of potato. There was no evidence of an "animal-protein-factor" effect, or an aureomycin effect. The experiments indicate the possibility of using the mycelium residues as a source of protein in animal feeding.—M. B. Richards.

718

SURE, B. (with EASTERLING, L., DOWELL, J. and CRUDUP, M.) **Improving the nutritive value of cereal grains. 1. Improvement in the efficiency of the proteins in milled wheat flour with lysine, valine, threonine and an extract from condensed fish solubles.** *J. Nutrition*, 1953, 50, 235–244. [Dept. Agric. Chem., Univ. Arkansas, Fayetteville.]

Groups of 6 male and 6 female rats were given to appetite for 6 weeks a basal diet of white flour 86.4, cellu flour 2.0, salts 4.0, vegetable shortening 3.0, cod liver oil 2.0, wheat germ oil 1.0, cerelese 1.6 per cent. and vitamins of the B complex. The protein content was about 9 per cent. A supplement of 0.4 per cent. L-lysine increased growth, protein efficiency and weight gain per g. N intake, which were further increased by addition of 0.2 per cent. DL-threonine, although threonine without lysine had a depressing effect. Addition of 0.7

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per cent. DL-valine to lysine and threonine and, better still, addition of an extract of condensed fish solubles to the 3 amino-acids further increased growth, protein efficiency and weight gain per g. N intake. The last was equal to the weight gain per g. N obtained with a ration containing 10 per cent. protein derived from dried non-fat milk solids.

In an experiment lasting 12 weeks a supplement of vitamin B₁₂ added to the basal diet plus lysine gave an appreciable increase in growth due to increased food consumption in male but not female rats.

Rats on the basal ration supplemented with the 3 amino-acids with or without the fish solubles extract were bred. During pregnancy and lactation extra fat-soluble vitamins were given, and during lactation extra threonine and tryptophan. Reproduction was satisfactory but lactation was not optimum.

Economy of food utilisation was studied with 4 groups of 6 weanling rats given basal ration, basal with lysine, with lysine and valine and with all 3 amino-acids. During the first 6 weeks, when food intake was restricted to 7 g. daily, lysine alone and with valine gave equal increases in food economy. The addition of threonine gave a further increase. During the next 6 weeks, when food was allowed to appetite, each successive supplement stepped up the economy of food utilisation.—F. C. Aitken.

719

SURE, B. (with EASTERLING, L., DOWELL, J., CRUDUP, M. and SCRIMSHAW, N. S.) **Protein efficiency. Improvement in whole yellow corn with lysine, tryptophan, and threonine.** *J. Agric. Food Chem.*, 1953, **1**, 626–629. [Dept. Agric. Chem., Univ. Arkansas, Fayetteville.]

In tests in which groups of 12 young rats were fed to appetite for 6 weeks addition of lysine increased growth and protein efficiency of U.S. yellow maize, and tryptophan caused a further increase, but with methionine or threonine there was no additional increase. Addition of threonine to the supplement of 3 amino-acids caused a marked increase in growth and feed consumption but not in protein efficiency.

In N retention tests in which the diet was given to appetite the biological value of the U.S. yellow maize supplemented with lysine, tryptophan and methionine was increased 7 per cent. by addition of 0.5 per cent. DL-threonine.

In subsequent experiments with U.S. yellow maize and 2 types of Guatemala yellow maize, food was restricted to 7 g. daily for 15 days and for the next 30 days was given to appetite. With the U.S. maize 0.5 per cent. DL-threonine increased

protein efficiency when added to a supplement of 0.4 per cent. L-lysine, 0.5 per cent. DL-tryptophan and 0.5 per cent. DL-methionine, but not when methionine was omitted. The percentage increases were 33.3 during restricted feeding and 21.7 during the next 30 days. With the Guatemala maize DL-threonine increased protein efficiency when added to L-lysine and L-tryptophan in the absence of methionine.

The 3 samples of maize had the same methionine content. Protein contents were 8.94 (U.S.), 8.3 and 9.1 (Guatemala) per cent. The basal U.S. maize diet consisted of maize 86, salts 4, vegetable fat 3, cod liver oil 2, wheat germ oil 1 and cerelese 4, with B vitamins. In the Guatemala maize diets maize formed 86.9 or 79.3 per cent. with corresponding differences in cerelese content. The diets contained 7.7 or 7.2 per cent. protein.

F. C. Aitken.

720

CARROLL, R. W., HENSLEY, G. W., SITTLER, C. L., WILCOX, E. L. and GRAHAM, W. R. (Jr.) **Absorption of nitrogen and amino acids from soybean meal as affected by heat treatment or supplementation with aureomycin and methionine.** *Arch. Biochem. Biophys.*, 1953, **45**, 260–269. [Res. Labs., Quaker Oats Co., Chicago, Ill.]

Rats received rations in which raw or heated solvent soya bean meal was the sole protein source and which contained chromic oxide as marker. The total N content of the diet was 3.5 per cent. After 3 days the animals were killed and samples of faeces and of the contents of the terminal part of the small intestine, caecum and colon were taken for analysis. As calculated from the nitrogen : chromic oxide ratios, absorption of N was greater from the heated than from the raw meal, particularly in the small intestine. A larger proportion of the N of raw meal was absorbed from the caecum or colon.

Aureomycin supplementation increased N absorption from the small intestine, and with heated meal, but not with raw, there was a slight increase in the total N absorbed. Methionine supplementation had no effect on the amount or site of N absorption. The absorption of lysine, leucine and methionine resembled that of total N; however, with cystine there was a large relative excess in the small intestine of animals given the raw meal. The unabsorbed cystine appeared to be destroyed, presumably by micro-organisms, lower down in the intestinal tract; this process was inhibited by aureomycin. The failure to absorb cystine in the small intestine and its later destruction might explain previous findings on the effect of adding cystine or methionine to diets containing raw soya bean meal.—C. Warner.

721

HENSLEY, G. W., CARROLL, R. W., WILCOX, E. L. and GRAHAM, W. R. (Jr.) **The effects of aureomycin and methionine supplements fed to rats receiving soybean meals.** *Arch. Biochem. Biophys.*, 1953, **45**, 270-274. [Res. Labs., Quaker Oats Co., Chicago, Ill.]

Rats received diets containing a small amount (1.6 per cent. total N) of raw or heated solvent soya bean meal as sole protein source and supplemented with 0.02 per cent. aureomycin or 0.5 per cent. methionine or both. Gain in weight and efficiency of feed utilisation were measured for 49 days. Aureomycin increased growth and utilisation of both raw and heated meals, but the degree of improvement with raw meals was very much greater. Methionine alone produced a similar but slightly greater effect; methionine with aureomycin had little additional effect in female rats but increased the weight gain of males.

It is suggested that, in the absence of antibiotic, potentially available dietary methionine may be lost to the animal as a result of the activities of the intestinal microflora; this effect is greater with raw than with heated meal, because with the former there is a tendency for N to pass further down the intestinal tract, and hence into regions of greater microbial activity, before absorption.

C. Warner.

722

MAURER, W. Neubildungsrate einzelner Serum-Eiweiss-Fractionen nach Gabe von S^{35} . Methionin und Transportfunktion der Serum-Eiweiss-Fractionen für Phosphatide und die organischen Jodverbindungen des Serums (Papierelktrophorese von S^{35} , P^{32} und J^{131} markiertem Serum-Eiweiss). [Rate of new formation of serum protein fractions after giving ^{35}S -methionine and the transport function of serum protein fractions for phosphatides and the organic iodine compounds of serum (paper electrophoresis of serum proteins labelled with ^{35}S , ^{32}P and ^{131}I).] *Arch. exp. Pathol. Pharmacol.*, 1953, **218**, 26-36. *Proc.* [Cologne.]

723

ALMQUIST, H. J. **Interpretation of amino acid requirement data according to the law of diminishing returns.** *Arch. Biochem. Biophys.*, 1953, **44**, 245-247. [Grange Co., Modesto, Calif.]

If the weight gain response or the ratio of weight gain to feed intake is plotted against the logarithm of the nutrient intake, a curve results which reaches a plateau, and so exemplifies the law of diminishing returns. The author plots in this way the data of several other workers concerning amino-acid requirements, and claims several advantages in interpretation.—C. Warner.

724

BERG, C. P. **Physiology of the D-amino acids.** *Physiol. Rev.*, 1953, **33**, 145-189. [Dept. Biochem., State Univ. Iowa, Iowa City.]

725

ELMAN, R. **Time factors in the utilization of a mixture of amino acids (protein hydrolysate) and dextrose given intravenously.** *J. Clin. Nutr.*, 1953, **1**, 287-294. [Dept. Surg., Sch. Med., Washington Univ., St. Louis, Mo.] Spanish summary.

N balance studies on 4 subjects given glucose and amino-acids together or separately showed that utilisation of an infused amino-acid mixture was increased by simultaneous infusion of glucose and was better when infusion with glucose was slow than when it was fast. Glucose utilisation was increased by simultaneous infusion of amino-acids.—F. C. Aitken.

726

MUNRO, H. N. and THOMSON, W. S. T. **Influence of glucose on amino acid metabolism.** *Metabolism*, 1953, **2**, 354-361. [Dept. Biochem., Univ. Glasgow.]

Administration of 50 mg. glucose to 6 fasting men reduced plasma amino-N by 12 per cent. in 1 hr. At the end of 2 hr. the level had risen slightly, but by the 3rd hour it had not reached fasting level. Administration of 30 g. fat in place of glucose caused a gradual decline amounting to a fall of 4.4 per cent. at 3 hr. The effect of glucose was highly significant, the effect of fat of borderline significance. A similar effect of glucose was found in rats. Microbiological estimates of plasma essential amino-acids after glucose administration to the 6 subjects showed that the relative reductions in levels of essential amino-acids, the value for tryptophan being taken as 1.0, follow the pattern of man's relative requirements of these amino-acids, tryptophan again being taken as 1.0.

Microbiological estimation of free and total tryptophan excretion in the urine of 4 men after glucose ingestion failed to substantiate the claim of Albanese *et al.* (Abst. 4714, Vol. 17) that glucose ingestion causes an immediate fall in tryptophan excretion.—F. C. Aitken.

727

WHARTON, M. A. and PATTON, M. B. **Amino acid excretion on different protein intakes.** *J. Amer. Dietetic Assoc.*, 1953, **29**, 762-764. [Ohio Agric. Exp. Stat., Columbus.]

Of 18 women in 2 groups, some received on the average 148 mg. N and the others 196 mg. N per kg. bodyweight daily from foods described as "common to the American dietary". The first

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group had an average N balance of about + 5, the second of + 32 mg. per kg. The second group received 5 to 13 per cent. more of arginine, histidine, isoleucine, leucine, lysine, phenylalanine, threonine and valine than the first, but no significant difference could be found in the urinary excretion of these amino-acids. There was, however, great individual variation in the amounts of these amino-acids excreted, particularly histidine, which was excreted in the largest quantity.—C. Warner.

728

ABBASY, A. S. and EISA, E. A. **The excretion of methionine in children in health and disease with a note on the value of methionine tolerance test as an index of liver function.** *Arch. Pediat.*, 1953, **70**, 146-156. [Dept. Paediat., Fac. Med., Univ. Alexandria.]

The daily urinary output of methionine, estimated in 67 healthy children, was not greatly influenced by variations in fluid intake. It amounted on the average to 33 mg. between the ages of 2 and 5 years, 61.5 mg. at 5 to 10 years, and 131 mg. at 10 to 15 years. In 30 healthy adults it ranged from 160 to 400 mg. The tolerance test consisted in intravenous injection of 50 mg. methionine per kg. bodyweight and collection of urine for 9 hr. afterwards. In 6 healthy children not more than 2.8 per cent. of the test dose was excreted during this time, but in 3 with hepatitis and severe jaundice the proportion was 9.2 to 21.8 per cent. The 24-hr. output of methionine in disease was studied in 39 children; it was consistently above the levels of excretion in health only in those with acute pneumonia or hepatitis.

M. S. Fraser.

729

EBERLEIN, W. R. **Aminoaciduria in childhood: cystinuria and cystinosis.** *Amer. J. Med. Sci.*, 1953, **225**, 677-686. [Dept. Paediat., Sch. Med., Johns Hopkins Univ., Baltimore, Md.]
A review with 72 references.

730

CAREDDU, P. Osservazioni sulla aminoacidemia e sulla aminoaciduria dopo il carico con idrolizzato proteico in bambini distrofici. [Amino-acid content of the blood and urine in dystrophic children after administration of protein hydrolysates.] *Boll. Soc. ital. Biol. sper.*, 1952, **28**, 1938-1939. [Clin. Pediat., Univ. Sassari.]

Amino-N was estimated in the blood and individual amino-acids were identified by paper chromatography in the serum and urine of normal and dystrophic children, with and without administration of protein hydrolysates. In normal children blood amino-N rose to a peak 2 hr. after administration of hydrolysates and returned to normal

within 4 hr. In the dystrophic children the increase was slower and the maximum, which was lower, was reached after 4 hr.

The amino-acids identified in the serum of normal and dystrophic children were aspartic acid, glutamic acid, serine, taurine, glycine, alanine, proline, valine, leucine and phenylalanine. They did not change after administration of protein hydrolysates, but the spots on the chromatogram were darker.

In the chromatogram of the urine, after administration of hydrolysates, no change occurred with the normal children, but in samples from dystrophic children new spots appeared. The amino-acids identified before administration were glycine, alanine and β -alanine; afterwards aspartic acid, glutamic acid, serine, tyrosine, proline, phenylalanine, leucine and several unidentified substances appeared.—E. M. Hume.

731

GINGRAS, R. Contribution à l'étude du métabolisme de quelques acides aminés. [Metabolism of some amino-acids.] *Laval méd.*, 1953, **18**, 727-744. [Fac. Méd., Laval Univ., Québec.]

This lecture gives some account of work by the author and his colleagues on the use of synthetic amino-acids in the nutrition of the rat. Hexoserine given as 1 per cent. of the diet produced retardation of growth and disturbances of protein metabolism as shown by a low serum protein value and raised values for muscle creatine and urinary creatinine. Anaemia also occurred, and the effects of hexoserine appeared to be those of an antagonist to lysine. Pentoserine was synthesised and given to rats and chicks. It had no apparent effect on the growth of the rat but seemed to act as a precursor of arginine for the chick. Analogues of methionine and cystine had no obvious effect on growth or fat deposition in rats. Further studies of unnatural synthetic amino-acids are to be made.—A. M. Copping.

732

FROST, D. V. and SANDY, H. R. **Effects of mineral deficiencies on amino acid utilization. Critical role of potassium and phosphorus.** *Proc. Soc. Exp. Biol. Med.*, 1953, **83**, 102-105. [Abbott Labs., N. Chicago, Ill.]

Rats were depleted on a protein-free diet and were then given daily 18.5 ml. of a 5 per cent. fibrin hydrolysate, containing 0.24 g. N, with mineral mixtures. Lack of Ca, Mg or Na in the diet had little effect on the growth response. A diet lacking P supported slow growth, but lack of K resulted in considerable loss of weight, with haemorrhage leading to death if untreated; a prompt growth response was observed when either deficiency

was corrected. The K requirement in these conditions was found to be about 14 mg. daily. The addition of 10 m. equiv. KH_2PO_4 per litre to 5 per cent. protein hydrolysates for intravenous use is recommended.—C. Warner.

733

DATTA, S. P. and HARRIS, H. **Urinary amino-acid patterns of some mammals.** *Ann. Eugenics*, 1953, **18**, 107–116. [Dept. Biochem., University Coll., London.]

Two-dimensional paper chromatograms were made from urine of 22 species of mammals, including 13 carnivores. The results are tabulated and sketches of the chromatograms are given.

All the carnivores excreted methylhistidine in high concentrations, which is probably attributable to the amount of anserine in the diet. Some of the differences were not referable to the diet, such as the high concentration of cystine excreted by the Kenya genet, and the "cat-spot", identified as cystein-*S-isopentanol*, from the urine of several species of cat.—D. Duncan.

734

BERLIN, N. I., TOLBERT, B. M., LEE, B. M. and LOTZ, C. **Metabolism of glycine 2- C^{14} in man: the tissue distribution and urinary excretion of C^{14} .** *Amer. J. Med.*, 1952, **12**, 608. *Proc.* [Berkeley, Calif.]

735

CRISPELL, K. R., PARSON, W. and HARDEN, G. **Effect of high and low protein on N^{15} excretion rates following injection and ingestion of tagged glycine in normal subjects.** *Amer. J. Med.*, 1953, **14**, 748. *Proc.* [Dept. Med., Univ. Virginia, Charlottesville.]

736

ARNSTEIN, H. R. V. and NEUBERGER, A. **The synthesis of glycine and serine by the rat.** *Biochem. J.*, 1953, **55**, 271–280. [Nat. Inst. Med. Res., Mill Hill, London.]

For the composition of the amino-acid diets see Arnstein and Neuberger (Abst. 487, Vol. 24). Groups of rats at weaning received one of these diets or a basal casein diet containing $\alpha\text{-}^{14}\text{C}$ -glycine 20, unextracted casein 125, salt mixture 40, cod liver oil 16, arachis oil 64, cane sugar 340 and maize starch 395 parts. After 20 to 39 days animals were killed for isolation of serine and glycine from the viscera or whole carcass. Several groups received supplements of vitamin B_{12} , choline or methionine, separately or together.

The specific activity of glycine from the visceral proteins was about 40 per cent. of that of the dietary glycine, and it was not affected by growth rate. Glycine from the mixed carcass proteins

always had a lower specific activity, 45 to 92 per cent. of that of visceral glycine, but its activity increased with increasing growth rate.

Glycine formation was constant at about 133 mg. per rat daily, independent of glycine intake, and serine formation at about 350 mg., suggesting that most of the body glycine was derived from serine. The activity of body glycine was always 20 to 35 per cent. greater than that of the serine.

The appearance of labelled C from the $\alpha\text{-C}$ atom of dietary glycine in the $\beta\text{-C}$ atom of serine was proportional to the glycine intake, suggesting that endogenous glycine is not an important source of the $\beta\text{-carbon}$ of serine and that the conversion is used mainly to deal with excess dietary glycine. It is considered that the relatively constant glycine level of the tissues is maintained by regulation of its degradation, not of its formation.—D. Duncan.

737

ROTHSTEIN, M. and MILLER, L. L. **The conversion of L-lysine-6- C^{14} to pipecolic acid in the rat.** *J. Amer. Chem. Soc.*, 1953, **75**, 4371–4372. [Dept. Radiation Biol., Sch. Med. Dent., Rochester, N.Y.]

After L-lysine-6- C^{14} monohydrochloride had been injected intraperitoneally into rats, urine collected for 24 hr. was found to contain a radio-active constituent corresponding to L-pipecolic acid. The high specific activity is taken to indicate that the acid is involved in the conversion of L-lysine to α -aminoadipic acid.—D. Harvey.

738

HEATH, H., RIMINGTON, C., GLOVER, T., MANN, T. and LEONE, E. **Studies using radioactive sulphur on ergothioneine formation in the pig.** *Biochem. J.*, 1953, **54**, 606–611. [Dept. Chem. Pathol., University Coll. Hosp. Med. Sch., London, W.C.1.]

Ergothioneine, secreted by the seminal vesicles, is a normal constituent of boar semen. In the present experiments 2 boars were given ^{35}S -labelled sulphate, thiolhistidine, methionine or ergothioneine and the distribution of ^{35}S was studied in the blood, urine and semen. Neither sulphate nor thiolhistidine was utilised in the formation of ergothioneine. The S of methionine was incorporated into ergothioneine and dietary ergothioneine appeared in the seminal plasma.

W. Godden.

739

ARNSTEIN, H. R. V. and CRAWHALL, J. C. **The metabolism of DL- $[\beta\text{-}^{14}\text{C}]$ and DL- $[\text{C}^{35}\text{S}]$ cystine by the rat.** *Biochem. J.*, 1953, **55**, 280–285. [Nat. Inst. Med. Res., Mill Hill, London.]

When fed on $\beta\text{-}^{14}\text{C}$ -cystine with α -amino- γ -phenylbutyric acid and *p*-aminobenzoic acid, rats excreted in the urine methyl-labelled acetate as

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acetaminophenylbutyric acid; similar results were obtained with γ - ^{14}C -valine or α - ^{14}C -acetate. Very little radio-activity was found in urinary hippuric acid. On degradation of visceral proteins, high activity was found in glutamic acid, aspartic acid and alanine as well as cystine, low activity in serine and glycine and lower in methionine, leucine, valine and threonine. Choline from carcass and viscera was slightly labelled. When ^{35}S -cystine was given, the methionine of the visceral protein had only 0.7 per cent. of the activity of cystine from the same source.

It was concluded that the major pathway of cysteine metabolism is to pyruvate, that the β -carbon atom of cystine is not a precursor of methyl groups, and that, in confirmation of nutrition experiments, the synthesis of cystine from methionine and serine through cystathionine is not reversible to any appreciable extent.—C. Warner.

740

DE BASTIANI, G. and GRANATA, L. Azione diabetogena del glucosio nel ratto albino a dieta povera in cistina. [Diabetogenic action of glucose for the albino rat given a diet poor in cystine.]

DE BASTIANI, G., GRANATA, L. and SPERTI, L. Azione diabetogena di estratti di ipofisi anteriore nel ratto albino a dieta povera in cistina. [Diabetogenic action of anterior pituitary extracts for the albino rat given a diet poor in cystine.] *Boll. Soc. ital. Biol. sper.*, 1953, **29**, 224-227; 227-229. [Ist. Fisiol., Univ. Padua.]

Of 30 rats of weight about 100 g. maintained for 100 days on a diet low in cystine (Abst. 471, Vol. 4), 10 received no treatment, and the remainder were given twice a day an intraperitoneal injection of glucose increasing from 0.5 to 3.0 g. daily. Every 8 or 10 days one or two rats were killed. The rats given glucose showed in the first 15 to 20 days a moderate reduction of blood sugar, but after about 30 days 75 per cent. of them showed a steady rise accompanied by loss of weight, hunger and polyuria. Histological examination of the pancreas showed diabetic changes.

Two groups of 20 rats of weight about 100 g. were fed for 80 days on the same diet low in cystine, and one group received in addition for the last 40 days a daily intraperitoneal injection of anterior pituitary hormone increasing from 3 to 10 units. Another 20 rats received the same injections and a stock diet. In the group having stock diet growth was accelerated and there was slight reduction of blood sugar. There was some hyperplasia and hypertrophy of the islet tissue of the pancreas. In the rats having the diet poor in cystine, treatment with anterior pituitary hormone caused early loss of weight. Blood sugar fell at

first but after about the 30th day was above normal, and there were signs of degeneration in the islet tissue.—E. M. Hume.

741

TABÉCHIAN, H., BERGERET, B. and CHATAGNER, F. Métabolisme de l'acide L-cystéine-sulfinique, *in vivo*, dans le foie et le rein du rat. [Metabolism of L-cysteine sulphinic acid *in vivo* in the liver and kidney of the rat.] *Bull. Soc. Chim. biol.*, 1953, **35**, 615-622. [Lab. Chim. Biol., Fac. Sci., Paris.]

742

AWAPARA, J. 2-Aminoethanesulfinic acid: an intermediate in the oxidation of cysteine *in vivo*.

AWAPARA, J. and WINGO, W. J. On the mechanism of taurine formation from cysteine in the rat. *J. Biol. Chem.*, 1953, **203**, 183-188; 189-194. [M. D. Anderson Hosp. Cancer Res., Univ. Texas, Houston.]

In continuation of earlier work (Abst. 651, Vol. 20) it is shown that a third compound in addition to alanine and taurine is formed in the liver of the rat after intravenous injection of cysteine. This compound was isolated and shown to be 2-aminoethanesulphinic acid. It was identical with a synthetic sample prepared from taurine by benzylation and subsequent reduction and hydrolysis of the sulphonyl chloride. It is probably identical with the hypotaurine reported by Chatagner and Bergeret (*C.R. Acad. Sci.*, 1951, **232**, 448). On oxidation with 30 per cent. H_2O_2 it was converted quantitatively to taurine.

After intravenous injection of cysteine labelled with ^{35}S , chromatographic examination of liver extracts showed the presence of significant amounts of both 2-aminoethanesulphinic acid and taurine labelled with ^{35}S . Cysteic acid was not detected.

W. Godden.

743

WILLIAMSON, M. B. and FROMM, H. J. Utilization of sulfur amino acids during healing of experimental wounds. *Proc. Soc. Exp. Biol. Med.*, 1953, **83**, 329-333. [Dept. Biochem., Sch. Med., Loyola Univ., Chicago, Ill.]

Rats received a protein-free diet for 5 days before being wounded by removal of skin from the back of the neck. The basal diet was then supplemented for half the 36 rats with 60 mg. DL-alanine per 100 g. diet, and for the remainder with 100 mg. DL-methionine per 100 g. diet. Two days after wounding each rat received a subcutaneous injection of 0.85 mg. methionine labelled with ^{35}S , and groups were killed 3, 6 and 10 days later.

The ^{35}S content of regenerating wound tissue increased with time, but that of normal skin, liver

and muscle decreased. Total S showed the same trend, but in a much smaller degree. There was a low N concentration in healing wound tissue; it rose with the progress of healing.

Partition of ^{35}S into cystine- and methionine- ^{35}S showed that in wound tissue the greater part of the ^{35}S was in cystine, and the rate of deposition of cystine in the healing tissue was greater than that of methionine. The rate of healing was found to be directly proportional to the rate of cystine deposition.—D. Duncan.

744

WESTALL, R. G. **The amino acids and other ampholytes of urine. 2. The isolation of a new sulphur-containing amino acid from cat urine.** *Biochem. J.*, 1953, **55**, 244–248. [Med. Unit, University Coll. Hosp. Med. Sch., London.]

745

LANG, K. and MAYER, U. **Über Bildung und Abbau von L-Oxyprolin. [Formation and destruction of L-hydroxyproline.]** *Biochem. Ztschr.*, 1953, **324**, 237–240. [Physiol. Chem. Inst., Johannes Gutenberg Univ., Mainz.]

By means of the proline oxidase present in mitochondria, L-hydroxyproline was oxidised to the half-aldehyde of γ -hydroxyglutamic acid, which other workers had conjectured to be an intermediate product in the breakdown of hydroxyproline. The substance was isolated in the form of its dinitrophenylosazone and its constitution was studied. Attempts to demonstrate oxidation of L-proline to hydroxyproline failed because of the high content of proline oxidase in the organs used, which destroyed the proline and hydroxyproline so rapidly that no increase of hydroxyproline could be demonstrated.—M. B. Richards.

746

ŠPAČEK, M. **Tryptophane metabolites in human urine.** *Nature*, 1953, **172**, 204. [Div. Labs., Dept. Health Welfare, Charlottetown, Prince Edward Island.]

747

LANG, K., TOUSSAINT, W. and KIEKEBUSCH, W. **Toxische Wirkungen von DL-Valin. [Toxic action of DL-valine.]** *Biochem. Ztschr.*, 1953, **324**, 138–143. [Physiol. Chem. Inst., Univ. Mainz.]

Additions of 5 to 50 mg. DL-valine daily to diets containing protein of inferior quality, e.g., potato protein, wheat gluten or rice gluten, proved toxic to young rats. After 14 days many showed haemorrhages and necroses on the tail and hind legs and the fur became rough and lustreless. Many animals died within 4 weeks. Comparative

experiments with L- and D-valine showed clearly that the toxicity of DL-valine was due to the D-component. With diets containing high-quality protein, e.g., wheat groats and whole powdered milk, additions of DL-valine were not toxic, except for slight transient changes in skin and fur.

M. B. Richards.

748

LEVINE, M. and FOPEANO, J. V. (Jr.) **Effect of ethionine on protein content of liver in growing rats.** *J. Biol. Chem.*, 1953, **202**, 597–605. [Dept. Biol. Chem., Med. Sch., Univ. Michigan, Ann Arbor.]

Rats were given diets of casein, sucrose, starch, fats, salts and vitamins, with or without choline, and the effect of adding ethionine to the diet was studied. Controls without ethionine were paired with experimental animals or fed to appetite. The inhibition of growth in rats of both sexes given ethionine appeared to be partly due to their lower food intake, particularly in the animals not receiving choline. The rats given ethionine showed smaller weight gains per g. food consumed than the paired controls. The livers of rats of both sexes receiving ethionine but not choline contained more water than those of controls; when choline was given there was no difference. Male rats receiving ethionine but not choline tended to have a lower liver lipid content than controls fed to appetite, but not lower than pair-fed controls. Ethionine given to male rats receiving choline, or to female rats with or without choline, resulted in a higher liver lipid content than in control groups.

Rats of both sexes receiving ethionine but not choline had a higher liver protein content, expressed as percentage of bodyweight, than pair-fed animals, though not higher than those fed to appetite. Addition of choline to the diet reduced these differences below the significant level. It is suggested that ethionine in the diet brings about formation of abnormal protein which accumulates in the liver; addition of choline spares methionine to antagonise the effects of ethionine.—C. Warner.

749

HETZEL, B. S., SCHOTTSTAEDT, W. W., HINKLE, L. E. and WOLFF, H. G. **Changes in urinary nitrogen excretion during stressful life experiences and their relation to thyroid function.** *J. Clin. Endocrinol.*, 1953, **13**, 881–882. *Proc.* [Dept. Med., New York Hosp.-Cornell Med. Centre.]

750

WISS, O. **Der enzymatische Abbau des Kynurenins und 3-Oxy-kynurenins im tierischen Organismus. [Enzymic breakdown of kynurenine and 3-hydroxykynurenine in the animal**

N.A. and R., January 1954

organism.] *Hoppe-Seyler's Ztschr.*, 1953, **293**, 106-121. [Max-Planck-Inst. Biochem., Univ. Tübingen.]

751

BENEDICT, J. D., YÜ, T. F., BIEN, E. J., GUTMAN, A. B. and STETTEN, D. (Jr.) **A further study of the utilization of dietary glycine nitrogen for uric acid synthesis in gout.**

BIEN, E. J., YÜ, T. F., BENEDICT, J. D., GUTMAN, A. B. and STETTEN, D. (Jr.) **The relation of dietary nitrogen consumption to the rate of uric acid synthesis in normal and gouty man.** *J. Clin. Invest.*, 1953, **32**, 775-777; 778-780. [Div. Nutrit., Pub. Health Res. Inst. City of New York, Inc.]

Two normal and 4 gouty subjects, 2 of whom were excreting excessive quantities of uric acid in the urine, were maintained on a low-purine, restricted-protein diet. After 5 to 10 days each received ^{15}N -labelled glycine by mouth, and urine was then collected for 9 days.

The 2 subjects with high uric acid excretion excreted isotope in far higher concentration than the normal controls, with maxima on the 2nd instead of the 4th day. In the other 2 gouty subjects the effect was slight or absent. The first 2 eliminated a larger fraction of the ingested glycine N as uric acid. It is not known whether there are 2 distinct types of gouty metabolism or whether the results indicate different stages of the same process.

Uric acid production after administration of ^{15}N -labelled glycine was studied in a normal subject and one with gout who excreted excessive quantities of uric acid. Each subject was studied while on a low-purine diet and on the same diet with added skimmed milk powder to increase the protein intake.

In both subjects the incorporation of ^{15}N into uric acid was more rapid on the high-protein diet, and a greater fraction of the labelled glycine N was excreted in the total urine N.

The results appear to support the advisability of restricting dietary protein where reduction of uric acid formation is desirable.—D. Duncan.

752

ANDREU URRÁ, J. and RÍOS MOZO, M. **Metabolismo del ácido úrico y diabetes mellitus. [Metabolism of uric acid and diabetes mellitus.]** *Rev. clín. española*, 1953, **49**, 160-167. [I. Clin. Méd., Univ. Seville.] English, German and French summaries.

A study of 36 patients with diabetes mellitus showed the frequent occurrence of high values for blood uric acid. Administration of insulin had no effect in reducing them. The presence of alloxan in the blood could not be demonstrated by the

authors, nor could they reproduce Griffith's experiments on the production of diabetes by injections of uric acid. In spite of these results it is considered possible that there may be a pathogenic relationship between uric acid, alloxan and diabetes.—M. B. Richards.

753

CUMMINGS, J. N. **Creatine and guanidoacetic acid metabolism in muscle disease.** *Brain*, 1953, **76**, 299-310. [Lab. Clin. Pathol., Nat. Hosp., Queen Sq., London.]

754

BUCHANAN, J. M. and WILSON, D. W. **Bio-synthesis of purines and pyrimidines.** *Federation Proc.*, 1953, **12**, 646-650. [Dept. Physiol. Chem., Sch. Med., Univ. Pennsylvania, Philadelphia.]

755

GREENBERG, G. R. **Mechanisms involved in the biosynthesis of purines.** *Federation Proc.*, 1953, **12**, 651-659. [Dept. Biochem., Sch. Med., W. Reserve Univ., Cleveland, Ohio.]

756

DINTZIS, R. Z. and HASTINGS, A. B. **The effect of antibiotics on urea breakdown in mice.** *Proc. Nat. Acad. Sci., Washington*, 1953, **39**, 571-578. [Dept. Biol. Chem., Med. Sch., Harvard Univ.]

Tissue from the stomach, small intestine, caecum and colon of mice was incubated with ^{14}C -labelled urea and $^{14}\text{CO}_2$ was collected as an indication of urease activity. The urea breakdown was found to be related to the presence of bacteria in the suspending medium. When mice were fed on a diet containing sulphaguanidine, terramycin and penicillin in order to reduce the intestinal bacterial count to a low level, there was no urease activity in similarly prepared tissues.

Breakdown of labelled urea given intraperitoneally *in vivo* was almost completely eliminated in mice given the antibiotic mixture or penicillin alone. It is therefore considered that urease activity in mammals, a potential source of ammonia poisoning, is due to the presence of bacteria.

D. Duncan.

757

GRAY, F. V., PILGRIM, A. F. and WELLER, R. A. **Conversion of plant nitrogen to microbial nitrogen in the rumen of the sheep.** *Nature*, 1953, **172**, 347-348. [Div. Biochem. Gen. Nutrit., C.S.I.R.O., Univ. Adelaide.]

In sheep fed on wheaten hay there was more than twice as much N per g. lignin in fodder as in the plant residues in the rumen, and more than

half the total rumen N was in the micro-organisms. Sheep slaughtered at intervals of 2½ to 16 hr. after feeding showed that these proportions did not vary greatly, as microbial N varied from 45 to 54 per cent. of the total. There is, therefore, considerable conversion of plant to microbial N and no significant gain or loss of N in the rumen except

by passage of the contents to lower levels of the digestive tract; the losses due to absorption of ammonia are small on a diet of wheaten hay.

A. T. Phillipson.

See also Absts. 321, 359, 449, 485-87, 489, 490, 492, 524, 540, 569, 578, 579, 698, 831, 853-55, 887, 987, 1137, 1355, 1357.

FATS AND OTHER LIPIDS

758

HILDITCH, T. P. **Chemistry of the lipids.** *Annu. Rev. Biochem.*, 1953, **22**, 125-140. [Univ. Liverpool.]

759

ARTOM, C. **Lipid metabolism.** *Annu. Rev. Biochem.*, 1953, **22**, 211-232. [Dept. Biochem., Bowman Gray Sch. Med., Winston-Salem, N.C.]

760

GURIN, S. **Lipogenesis.** *New Engl. J. Med.*, 1953, **248**, 965-970. *Proc.* [Dept. Physiol. Chem., Sch. Med., Univ. Pennsylvania, Philadelphia.]

761

DE LANGEN, C. D. Le foie et le transport des graisses. [The liver and transport of fats.] *Gastroenterologia*, 1953, **80**, 1-9. [Clin. Med., Univ. Utrecht.] German and English summaries.

762

JIMÉNEZ DÍAZ, C., ROMEO, J. M. and MARINA, C. Ulteriores estudios sobre la significación y genesis de las esteatorreas. [Further studies on the nature and etiology of steatorrhoea.] *Rev. clín. española*, 1953, **49**, 367-374. [Inst. Invest. Méd., Fac. Med., Madrid.] English, German and French summaries.

Direct estimations of fat in fresh faeces, confirmed by calculation from data obtained by bomb calorimetry on the dried faeces, showed that in some patients with idiopathic steatorrhoea the elimination of fat was greater than the intake. This was particularly evident on a low-fat diet. Moreover, fat elimination was sometimes higher on basal days with a 30 g. intake than on days with an intake of 130 g. The data support the view that idiopathic steatorrhoea is due, not to faulty absorption of fat, but to an increase in fatty secretion from the intestines. Ligature of the thoracic duct in dogs gave rise to steatorrhoea as long as the stasis of chyle persisted. The increase of fat elimination occurred in the contents of an isolated loop as well as in the faeces. It is possible that the

fat secretion which causes steatorrhoea is chyle discharged into the intestinal lumen instead of passing into circulation.—M. B. Richards.

763

COOKE, W. T., THOMAS, G., MANGALL, D. and CROSS, H. **Observations on the faecal excretion of total solids, nitrogen, sodium, potassium, water and fat in the steatorrhoea syndrome.** *Clin. Sci.*, 1953, **12**, 223-234. [Dept. Med., Univ. Birmingham.]

The results of analyses of faeces from patients with the steatorrhoea syndrome showed significant correlations between water, Na, K, fat, N and total solids. Though such correlation might have no functional significance, it was concluded that the correlations between fat content and total solids and between fat and total N might be of empirical significance. Partial correlation coefficients showed a significant direct correlation between water and Na excretion, but not between water and fat or between fat and Na excretion.

For analysis of the K figures it was necessary to consider the results in patients with formed stools separately from those in patients with diarrhoea. The mean K excretion in controls was 9.87 m. equiv. daily, in 4 patients with steatorrhoea and formed stools 22.75 m. equiv. daily; there was no significant difference between the 2 groups, but the variability was significantly greater in the steatorrhoea group. The administration of K by mouth made no significant difference in the faecal output, which suggested that the increase in K excretion in steatorrhoea was not related to impaired absorption. In 2 patients with diarrhoea the impaired K excretion seemed to be associated with increased water excretion.

No correlation was shown between fat excretion and diarrhoea, and in 2 patients with severe diarrhoea the amount of fat excreted greatly exceeded the total fat intake. Even when patients were given low-fat diets the daily fat excretion might greatly exceed the daily fat intake. When a large amount of butter was added to the diet of a severely ill patient nearly all the extra fat was absorbed. All these observations suggest that in patients with the steatorrhoea syndrome endogenous fat excretion is increased. It is suggested

that abnormalities of fat metabolism should be assessed on the amount of fat excreted and not on percentage absorption.—L. Wills.

764

HERZSTEIN, J., WANG, C. and ADLERSBERG, D.
Fat-loading studies in relation to age. *Arch. Int. Med.*, 1953, **92**, 265–272. [Dept. Med., Mount Sinai Hosp., New York.]

Attempts at chylomicron counting in serum or plasma were unsuccessful. The test was therefore limited to the study of total lipids and lipid fractions in the serum of young and elderly subjects after a fat meal. The subjects were in hospital, 10 aged 17 to 34, mean 24.9 years, and 11 aged 15 to 71, mean 62.0 years. Before the fat meal fasting total serum lipids in the 2 groups were not significantly different. Two hours after the test meal the mean rise for both groups was the same. The concentration in the young group fell almost to fasting level by the sixth hour. That of the older group was still high at 4 and 6 hr. and had not reached fasting level 24 hr. after the meal. A group of 6 blood donors aged 46 to 58, mean 50.3 years, responded like the young group.

F. C. Aitken.

765

FULLERTON, H. W., DAVIE, W. J. A. and ANASTASOPOULOS, G. **Relationship of alimentary lipaemia to blood coagulability.** *Brit. Med. J.*, 1953, **ii**, 250–253. [Dept. Med., Univ. Aberdeen.]

In 8 patients whose meals contained from 12 to 30 g. fat there was no significant variation in the prothrombin time as estimated with Russell viper venom during the day. In 5 subjects given a breakfast containing 65 g. fat there was an average reduction of 4.9 sec. in the clotting time at the height of postprandial lipaemia; when the fat content of the meal was raised to 85 g. the average reduction was 9.8 sec. When thromboplastins which contained large amounts of lipid were used, no reduction in clotting time was shown. Similar experiments in which the clotting time was estimated in silicone-treated tubes without thromboplastin showed that there was significant alteration in the clotting time only in subjects who showed macroscopic fat in blood up to 4 hr. after meals. It is suggested that the increased coagulability produced by fat may play a part in the increased incidence of thrombosis in conditions in which blood fat is high. The relation of thrombosis to a high fat intake and to arteriosclerosis is also discussed.—L. Wills.

766

TULLOCH, J. A., OVERMAN, R. S. and WRIGHT, I. S.
Failure of ingestion of cream to affect blood coagulation. *Amer. J. Med.*, 1953, **14**, 674–

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680. [Dept. Med., Cornell Univ. Med. Coll., New York.]

In a repetition of the work of Waldron *et al.* (*Gastroenterol.*, 1951, **17**, 360) the authors were unable to confirm the findings of these workers on the effect of ingested fat on the blood coagulation time. This they attribute to the fact that they used fresh cleaned and sterilised glass syringes for each venepuncture; the former workers used one syringe throughout each experiment, the syringe simply being washed in water and saline between punctures. They demonstrate that thrombin activity is present on the surface of glass syringes used in this way. Their findings raise doubts whether the fat of milk affects the clotting mechanism of blood.

W. Godden.

767

POMERANZE, J., BOYD, L. J. and GOLDBLOOM, A. A.
Clinical studies in geriatrics. 1. Serum lipid partitions. *Arch. Int. Med.*, 1953, **91**, 740–743. [Bird S. Coler Hosp. Med. Coll., New York.]

Total lipids, total cholesterol, cholesterol esters and phospholipins were estimated in blood serum from 26 male patients aged from 80 to 101 years and showing no clinical evidence of malnutrition. X-ray examinations indicated marked calcification of all larger and medium-sized arteries. All values for cholesterol were below 200 mg. and 5 were below 150 mg. per 100 ml. serum; the mean value was 188 ± 80 mg. per 100 ml. Serum lipid values were unrelated to weight, blood pressure or the occurrence of cardiovascular abnormalities, and in most subjects the phospholipin: cholesterol ratio was one not considered to be associated with atherosclerosis.—D. Harvey.

768

JACOBSON, N. L., ZALETEL, J. H. and ALLEN, R. S.
Effect of various dietary lipids on the blood plasma lipids of dairy calves. *J. Dairy Sci.*, 1953, **36**, 832–842. [Dept. Dairy Husb., Iowa Agric. Exp. Stat., Ames.]

Fifteen calves were suckled by their dams for 3 days after birth and were then divided into 5 comparable groups and fed on whole milk from the 4th to the 18th day. For the next 28 days one group continued to receive whole milk while the other groups were given synthetic milks consisting of 3 per cent. butterfat, crude or hydrogenated soya bean oil or lard and 10 per cent. fat-free dry milk solids; the diets were given twice daily at the rate of 10 lb. daily per 100 lb. bodyweight. Venous blood samples were taken 3 hr. after the morning feed when the animals were 11 days old and thereafter weekly. Ethanol-ether extracts of plasma were analysed for neutral fat, phospholipins, free and esterified cholesterol and free esterified fatty acids; plasma fat was estimated by the standard Allen method.

Total plasma lipids rose sharply in each group during the preliminary whole milk feeding period; except for the group which continued to receive whole milk, there was a sharp fall in plasma total lipid values as soon as the experimental diet was given. After this the group given crude soya bean oil showed a big increase in plasma lipids, which approached the value for animals fed on whole milk, and smaller increases in plasma lipids occurred in the calves given butterfat or lard. The decline in plasma lipids in the group given hydrogenated soya bean oil continued to the end of the experiment. Trends in components of the lipid fractions corresponded to those for total lipids, except that changes in the amounts of neutral fat and free fatty acids were not so large as those in the other fractions.—G. A. Garton.

769

RAMSEY, H. A., TOVE, S. B. and WISE, G. H. **Effect of diet on the diurnal variation of blood plasma lipides in young dairy calves.** *J. Dairy Sci.*, 1953, **36**, 591-592. [N. Carolina State Coll., Raleigh.]

770

WADDELL, W. R., GEYER, R. P., SASLAW, I. M. and STARR, F. J. **Normal disappearance curve of emulsified fat from the blood stream and some factors which influence it.** *Amer. J. Physiol.*, 1953, **174**, 39-42. [Dept. Nutrit., Harvard Sch. Pub. Health, Boston, Mass.]

Male albino rats were given intravenous injections of 2.5 mg. fat per g. bodyweight, in emulsions prepared from coconut, olive, cottonseed, linseed or mineral oil or cocoa butter with 3 per cent. cerebroside or 1 per cent. Demal-14 as the emulsifying agent. The influence of different emulsifying agents was investigated with coconut oil emulsified with soya bean phosphatide, purified cerebroside, gelatin-P-20, Demal-14 or Triton-WR-1339. At intervals of 5, 20 and 60 min. and thereafter at hourly intervals after the injection of the emulsion venous blood was withdrawn and the blood fat was estimated turbidimetrically.

The injection of fat emulsion brought about high blood fat values which fell rapidly except when gelatine was used as the emulsifying agent; in all other experiments a straight line resulted when the logarithm of blood fat concentration was plotted against time. The absolute rate of clearance of triglyceride fats did not depend on their chemical composition, but was affected by the emulsifying agent used.—G. A. Garton.

771

SPITZER, J. J. (with BOND, B. D. and GRUNWALD, E. R.) **Influence of protamine on alimentary lipemia.** *Amer. J. Physiol.*, 1953, **174**, 43-45.

[Dept. Physiol., Florida State Univ., Tallahassee.]

Blood fat was raised in dogs weighing 8 to 15 kg. by giving them about 30 ml. cod liver oil. Blood samples were taken for turbidimetric estimation of serum fat. At different intervals after the oil the animals were given 2 to 5 ml. of 1 per cent. aqueous solution of protamine sulphate by intravenous injection.

The injection of protamine caused an increase in the visible fat in serum, starting about 10 to 15 min. after injection and reaching a maximum 30 to 40 min. later. The increase was especially clear when the protamine was administered during the decreasing phase of alimentary lipaemia, though, once visible lipaemia had completely disappeared, protamine had no effect. Other anti-heparin substances, toluidine blue and neutral red, had no influence on visible lipaemia, and it is suggested that protamine causes mobilisation of fat.—G. A. Garton.

772

KRAMÁR, J. and LEVINE, V. E. **Influence of fats and fatty acids on the capillaries.** *J. Nutrition*, 1953, **50**, 149-160. [Dept. Paediat., Sch. Med., Creighton Univ., Omaha, Nebr.]

Groups of weanling albino rats were fed on a fat-free diet or the same diet with 5 per cent. methyl stearate or 5 per cent. maize oil. The capillary resistance and capillary permeability were estimated periodically for at least 150 days.

The capillary resistance of the rats on the fat-free diet or that containing methyl stearate began to decline at about the 50th day of the experiment; the decline, associated with increased permeability, occurred simultaneously with flattening of the growth curve, but before overt signs of fat deficiency appeared. On the diet containing maize oil none of these effects was observed. The capillary resistance was rapidly restored to normal by very small amounts of linseed oil, cottonseed oil or linoleic acid.—G. A. Garton.

773

LÉVY, M. and LEGRAND, J. **De l'utilisation des graisses et des glucides au cours des stéatoses provoquées par des régimes hypoprotidiques-hyperlipidiques. [Utilisation of fats and carbohydrates in steatosis induced by low-protein high-fat diets.]** *Arch. Sci. physiol.*, 1953, **7**, 267-273. [Lab. Physiol. Gén., Sorbonne.]

Rats weighing 150 g. each were fed for 6 weeks on a diet containing 5 per cent. casein and 40 per cent. pork fat. The animals received glucose and sucrose to appetite during a 2-day period 2 days after the beginning of the experiment and again for 2 days at the end. After each 2-day period the R.Q. of the animals was estimated in a Benedict

closed-circuit apparatus. Immediately after each period when carbohydrate was given and the R.Q. was measured, the animals received a mixture of lard and olive oil by stomach tube during a 24-hr. period, after which the R.Q. was again estimated.

No difference was found between the R.Q. of the animals fed on carbohydrate after 2 days on a high-fat diet and after 6 weeks on the same diet; it approximated to 0.70. Similarly, the R.Q. after administration of fat was approximately 1.0 whether the animals had been fed on the high-fat diet for 2 days or 6 weeks.—G. A. Garton.

774

GREENBERG, S. M. and FRAZER, A. C. (with ROBERTS, B.) **Some factors affecting the growth and development of rats fed rancid fat.** *J. Nutrition*, 1953, **50**, 421-440. [Dept. Pharmacol., Med. Sch., Univ. Birmingham.]

Male weanling Wistar rats were fed to appetite for 10 weeks on diets containing different proportions of casein with 10 per cent. soya bean oil, either fresh or rancid. The rancid oil had a peroxide number of 530 to 550 μmol . per g. To each 100 g. oil, fresh or rancid, was added 0.1 ml. ethyl laurate containing 500 μg . diacetyl, in an attempt to overcome any aversion the animals might have to the odour of rancid fat. The effect of whole dried liver, cortisone and several antibacterial drugs was also tested.

A diet containing 10 per cent. rancid oil supported almost normal growth in rats when casein constituted 30 per cent. of the diet; diets containing less protein supported normal growth in animals given fresh, but not rancid, oil, indicating with the latter an increased protein requirement. The only organ weight affected by rancid fat was the small intestine, which showed an increase, possibly owing to increased secretion of mucus.

Supplements of liver appeared to benefit, in proportion to their protein content, the rats given rancid oil. There was no increase in the growth of rats given rancid fat when cortisone or antibacterial drugs were administered.—G. A. Garton.

775

BOSSHARDT, D. K. and HUFF, J. W. **Nutritional deficiencies in mice caused by stress agents.** *J. Nutrition*, 1953, **50**, 117-127. [Dept. Biochem., Sharp and Dohme, Inc., West Point, Pa.]

Groups of 8 male weanling mice were fed on a low-fat diet containing maize oil 0.5, casein 20, glucose 4, salt mixture 2, cellulose 2, and white dextrin 55.5 parts, with added vitamins A and D, α -tocopherol, naphthaquinone, vitamins of the B group and choline. When 1 to 2 per cent. of succinylsulphathiazole (SST) or 5 to 10 per cent. of 1:20 aqueous extract of liver (Wilson's extract)

was added to the basal diet in place of an equivalent weight of dextrin the mice showed retardation of growth for 7 or 14 days. When both 2 per cent. SST and 2 per cent. liver extract were added the mice lost 0.3 g. in 7 days. These growth retardations could be prevented by increasing the fat content of the diet or adding 10 per cent. defatted cottonseed meal. Similar results were obtained with 1 per cent. SST plus 0.25 per cent. streptomycin or 15 per cent. triacetin and cottonseed meal or cottonseed oil.

When compared with those fed on the basal diet only, groups of mice given 0.16 mg. DL-thyroxine intraperitoneally once a week, or given the basal diet with 1 per cent. iodinated casein, did not grow so well; in contrast, groups given thyroxine, the basal diet and 25 per cent. cottonseed meal or 15 per cent. cottonseed oil grew better, as did also mice given 25 per cent. cottonseed meal or 15 per cent. cottonseed oil without thyroxine.

This suggested that the basal low-fat diet was not fully adequate for maximum growth of young mice and that young weanling mice required in their diet either long-chain fatty acids or a substance necessary for lipid synthesis. This was present in defatted cottonseed meal or was synthesised by intestinal organisms susceptible to SST.—J. M. Naftalin.

776

GUSTAFSON, G., STELLING, E. and BRUNIUS, E. **Experimental dental caries in golden hamsters—experiments with dietary fats having different contents of unsaturated fatty acids.** *Brit. Dent. J.*, 1953, **95**, 124-125. [Dept. Dent. Histopathol., Dent. Sch., Malmö.]

Cocoa fat with a low, olive oil with a medium and poppy seed oil with a high content of unsaturated acids were each incorporated at the 7 per cent. level in a purified diet for 323 weanling golden hamsters. Mortality was high and after 110 days the groups became too small to continue, but up to that time no difference in rate of growth existed between the groups and none was found in the incidence of caries.—D. Harvey.

777

CARD, C. S. and SCHULTZ, L. H. **Effect of the ration on volatile fatty acid production in the rumen.** *J. Dairy Sci.*, 1953, **36**, 599. *Proc. [Cornell Univ., Ithaca, N.Y.]*

778

KLEIBER, M., BLACK, A. L., BROWN, M. A. and TOLBERT, B. M. **Propionate as a precursor of milk constituents in the intact dairy cow.** *J. Biol. Chem.*, 1953, **203**, 339-346. [Coll. Agric., Univ. California, Davis.]

With the apparatus and technique previously described (Absts. 1470, 2626, Vol. 22; 729, Vol. 23), the distribution of ^{14}C after injection of sodium propionate labelled in positions 1 or 2 was studied. The amounts injected ranged from 9 to 12 μC . of ^{14}C per kg. bodyweight, 2 cows receiving the 1- ^{14}C and 2 the 2- ^{14}C salt. With the first 2 cows the specific activity of ^{14}C in the expired air reached a maximum in 3 to 5 min., and with the second 2 cows in 12 to 15 min. after the injection. Only 30 per cent. of the ^{14}C from the carboxyl group and less than 10 per cent. of the 2- ^{14}C transferred from the propionate to lactose passed through the carbon pool of the cow. Of the ^{14}C injected as 2- ^{14}C propionate over 7 per cent. appeared in the lactose, about 2 per cent. in the casein and 1 per cent. in the fat of the milk during 2 days after the injection. For 1- ^{14}C propionate the corresponding values were 4, 1 and 2 per cent.

W. Godden.

779

THIN, C. and ROBERTSON, A. **Biochemical aspects of ruminant ketosis.** *J. Comp. Pathol.*, 1953, **63**, 184-194. [Dept. Hyg. Prevent. Med., Royal (Dick) Sch. Vet. Studies, Univ. Edinburgh.]

The partition of ketone bodies in blood, milk, urine and rumen liquor of cows was studied by the analytical methods reported in Abst. 1548, Vol. 22. In normal healthy cows only β -hydroxybutyric acid was found in these fluids. In samples from 89 animals with bovine ketosis of varying severity, total ketones were much higher in all fluids than in normal animals. When total ketone bodies were above 60 mg. acetone per 100 ml. blood, acetone formed 42 and 50 per cent. of the total ketone bodies in blood and milk, respectively. In the urine samples of β -hydroxybutyric acid and acetoacetic acid were the main components, and in rumen liquor isopropanol. When total blood ketones were from 10 to 30 mg. acetone per 100 ml., β -hydroxybutyric acid was the chief constituent in blood, milk and rumen liquor, but was exceeded by acetoacetic acid in urine. In 15 cows with pregnancy toxæmia, in which the total ketone bodies in the blood amounted on the average to 67.87 ± 9.45 mg. acetone per 100 ml., β -hydroxybutyric acid accounted for just over 80 per cent. of the total.—W. Godden.

780

ENGEL, F. L. and HEWSON, K. **Fatty acid and ketone metabolism during hemorrhage and shock in the rat.** *Proc. Soc. Exp. Biol. Med.*, 1953, **83**, 608-611. [Dept. Med., Duke Univ., Durham, N.C.]

Male albino rats were fasted for 24 hr.; shock was then induced, under light anaesthesia, by cutting the tails and allowing haemorrhage

equivalent to 2.5 per cent. of the bodyweight to occur in 1 hr. The animals were under observation for 3 to 5 hr., during which blood samples were taken for ketone body and amino-N estimation. Another group of rats were treated similarly, except that adrenalectomy was performed 4 or 5 days before bleeding, and each animal received 0.5 mg. deoxycorticosterone acetate. Animals which showed an increase of less than 3 mg. per cent. in plasma amino-N 3 to 4 hr. after bleeding were classed as showing sublethal haemorrhage, those which showed a greater increase were considered to be in haemorrhagic shock.

While fasting control rats showed the expected progressive rise in blood ketones, all the animals with haemorrhage showed a reduction; adrenalectomised animals behaved similarly.

When an intravenous infusion of Na octanoate was given 2.5 hr. after haemorrhage, rats with sublethal haemorrhage showed a normal increase in blood ketones, but those in haemorrhagic shock showed considerably lower ketone levels.

G. A. Garton.

781

CHEVALLIER, F. **Le cholestérol: données chimiques et apport des méthodes isotopiques dans la connaissance de son métabolisme. [Cholesterol; chemical data and contribution of isotopic methods to the knowledge of its metabolism.]** *Ann. Nutr. Alimentation*, 1953, **7**, 305-338. [Inst. Nat. Hyg., Paris.]

A review.

782

COPPO, M. (with GUALANDI, G., BERTOLI, R., PEDERZINI, A., PRATI, G. LORENZINI, R. and LUSIANI, G.) **Il fattore lipidico nell'etiopatogenesi dell'aterosclerosi. [Lipids in the causation of atherosclerosis.]** *Quad. Nutrizione*, 1952, **12**, 231-239 (with discussion 240-284). *Proc.* [Ist. Clin. Med. Gen., Univ. Modena.]

783

SCHETTLER, G. **Arteriosklerose und Cholesterinstoffwechsel (unter besonderer Berücksichtigung der Diätfrage.) [Arteriosclerosis and cholesterol metabolism, with special reference to the question of diet.]** *Deutsch. med. Wochenschr.*, 1953, **78**, 989-993. [Med. Klin., Univ. Marburg a.d. Lahn.]

A review.

784

COCHRANE, G. C., MICHAELS, G. D. and KINSELL, L. W. (with CAWLEY, G., COELHO, M., FUKAYAMA, G., OLSON, F. and SMYRL, S.) **Dietary modifications of plasma cholesterol and phospholipid levels in diabetic patients. The effects of mixed diets high in vegetable fat.**

N.A. and R., January 1954

J. Clin. Nutr., 1953, **1**, 295-298. [Inst. Metabol. Res., Highland Alameda County Hosp., Oakland, Calif.] Spanish summary.

Replacement of animal fat by vegetable fat in high-protein, high-fat diabetic diets resulted in rapid decreases in plasma cholesterol and phospholipins in 5 diabetic patients and in 1 patient with familial hypercholesterolaemia. The effect of the vegetable fat diet was not attributed to low cholesterol intake, since a gradual but substantial fall in plasma lipids occurred in a diabetic patient given vegetable fat in addition to a diet high in animal fat.—F. C. Aitken.

785

BUGNARD, L., CHEVALIER, F. and COURSAGET, J. Utilisation du cholestérol- C^{14} pour l'étude de l'absorption et de l'excrétion intestinale du cholestérol chez le rat. [Use of ^{14}C -cholesterol in the study of absorption and intestinal excretion of cholesterol in the rat.] *J. Physiol., Paris*, 1953, **45**, 413-419. [Lab. Isotopes, Groupe Hosp. Necker-Enfants Malades, Paris.]

Rats deprived of cholesterol for 1 to 8 weeks were given daily supplements of 10 mg. ^{14}C -labelled cholesterol for several days. Faeces were collected and stored in ethanol; 24 hr. after the last administration of cholesterol the animals were killed, the blood was removed and the carcass was retained in ethanol. Faecal and carcass cholesterol were then extracted and radio-activity was measured.

Faecal cholesterol accounted for 20 to 25 per cent. of that administered, and 40 to 60 per cent. was found in the carcass. Thus 20 to 35 per cent. of the cholesterol had been destroyed in the intestine or in the tissues.—G. A. Garton.

786

SWELL, L. and FLICK, D. F. Effect of dietary fat and cholesterol on the blood cholesterol level in rats. *Amer. J. Physiol.*, 1953, **174**, 51-53. [Gen. Med. Res. Lab., Veterans Admin. Centre, Martinsburg, W. Va.]

Of 2 groups of rats, previously fed on a stock diet, one received a cholesterol-free diet and the other a diet containing 2 per cent. cholesterol. Each diet contained 25 per cent. lard for 20 days, then for 2 periods, each of 20 days, the lard was replaced, first by oleic acid and then by stearic acid. Before introducing the experimental diets and at intervals thereafter of 1 week or less, blood samples were taken for estimation of free and total cholesterol.

Blood cholesterol rose sharply in both groups of rats on the lard diet, the main increase being in the ester fraction. Oleic acid feeding occasioned a slight fall in total and ester cholesterol in both groups; this continued when stearic acid was

given and was more marked in the group which received cholesterol. It is suggested that a diet containing a high percentage of saturated fatty acids may impair the intestinal absorption of cholesterol.—G. A. Garton.

787

ALTSCHUL, R. Inhibition of experimental cholesterol arteriosclerosis by ultraviolet irradiation. *New Engl. J. Med.*, 1953, **249**, 96-99. [Dept. Anat., Sch. Med., Univ. Saskatchewan, Saskatoon.]

Eighteen rabbits were fed for 90 days on a stock diet; each received daily 0.3 g. pure cholesterol or 0.3 g. cholesterol heated at 300° C. for 30 min., contained in a gelatine capsule. The hair was removed periodically from the backs of the animals to facilitate penetration of the ultraviolet radiation to which they were exposed 3 times weekly for 10 to 60 min. Serum cholesterol was estimated in 14 rabbits at the beginning of the experiment and in all the rabbits at the end. Tissues were taken for histological examination, with particular reference to "cholesterol damage", including the presence and quantity of foam cells in the aortic intima, lipid cushions in coronary and lingual vessels and fat deposition in the adrenal cortex.

It is claimed that ultraviolet irradiation caused partial or complete inhibition of the "cholesterol damage" which could have been expected; serum cholesterol at the end of the experiment showed a slight increase or none in rabbits showing little or no cellular damage.—G. A. Garton.

788

BAJOCCHI, E. and BENDANDI, A. Tentativi di produrre un'arteriopatia sperimentale nel ratto. [Attempts to produce experimental disease of the arteries in rats.] *Boll. Soc. ital. Biol. sper.*, 1953, **29**, 10-11. [Ist. Clin. Med., Univ. Modena.]

No arterial lesion was produced in rats by a diet containing 4 per cent. cholesterol or by injection of rabbit serum containing rat antibodies.

E. M. Hume.

789

CLÉMENT, J. and LE BRETON, É. Étude du foie de rat soumis à un régime contenant du cholestérol et un cancérigène (*p*-diméthylaminoazobenzène). [The liver of the rat on a diet containing cholesterol and a carcinogen (*p*-diméthylaminoazobenzène).] *C.R. Acad. Sci.*, 1953, **237**, 97-99.

Rats fed for 2 years on a diet containing added cholesterol and 0.6 per cent. of *p*-diméthylaminoazobenzène (butter yellow) did not develop fatty livers or hepatomas. The addition of cholesterol alone caused fatty livers and the addition of butter yellow alone hepatomas.—G. A. Garton.

790

- TOMKINS, G. M., DAUBEN, W. G., SHEPPARD, H. and CHAIKOFF, I. L. **Squalene as a precursor of cholesterol in liver.** *J. Biol. Chem.*, 1953, **202**, 487-489. [Dept. Physiol., Sch. Med., Univ. California, Berkeley, Calif.]

791

- KRITCHEVSKY, D., MOYER, A. W. and TESAR, W. C. **Squalene feeding in experimental atherosclerosis.** *Arch. Biochem. Biophys.*, 1953, **44**, 241. [Viral and Rickettsial Res., Lederle Labs. Div., American Cyanamid Co., Pearl River, N.Y.]

In experiments with rabbits 3 per cent. squalene added to a normal diet was not found to induce a significant increase in atherosclerosis as did cholesterol at the same level, although squalene is believed to be an immediate precursor of the sterol and older reports have indicated an increase in liver cholesterol in animals given squalene.—D. Harvey.

792

- PETERSON, D. W., SHNEOUR, E. A., PEEK, N. F. and GAFFEY, H. W. **Dietary constituents affecting plasma and liver cholesterol in cholesterol-fed chicks.** *J. Nutrition*, 1953, **50**, 191-201. [Dept. Poultry Husb., Coll. Agric., Univ. California, Berkeley.]

The basal diet was the same as that previously reported (Abst. 647, Vol. 23) except that it contained 2 per cent. alfalfa meal instead of an equal amount of barley. All other additions were made at the expense of barley. The diet contained, by analysis, 0.05 per cent. cholesterol, 0.02 other sterols and 3.0 crude fat. Single-Comb White Leghorn chickens were given the experimental diets at 2 or 3 weeks of age. Pooled samples of plasma from 3 birds were analysed each week for total cholesterol. In some experiments post-mortem liver samples, after 4 to 6 weeks of the experimental diet, were analysed for cholesterol.

Inclusion of 1 per cent. cholesterol with 4 per

cent. cottonseed oil in the diet caused high cholesterol levels in plasma and liver. When the cottonseed oil was omitted there was only a moderate increase in plasma cholesterol. Soya sterols inhibited the rise in plasma and liver cholesterol, the optimum ratio for inhibition being 2 or 3 of sterols to 1 of cholesterol. Caprates of the sterols were ineffective; cholesteryl caprate did not produce a marked rise in plasma cholesterol and liver cholesterol was relatively low.—F. C. Aitken.

793

- SCHWENK, E. and BAKER, C. F. **Studies on the biosynthesis of cholesterol. 5. C¹⁴-cholesterol in the egg yolk and in the laying hen.** *Arch. Biochem. Biophys.*, 1953, **45**, 341-348. [Worcester Found. Exp. Biol., Shrewsbury, Mass.]

Acetate labelled with ¹⁴C in the carboxyl group was administered to hens by injection subcutaneously, intraperitoneally or directly into the crop gland. Eggs and organs were subsequently examined for the presence of ¹⁴C-labelled cholesterol and other ¹⁴C-containing material precipitated by digitonin.

When the birds were killed soon after administration of the labelled acetate, the ¹⁴C-labelled cholesterol in the body was accompanied by other digitonin-precipitable substances which showed a higher counting rate than the cholesterol; these substances were found also in the faeces. Ninety days after the initial injection, ¹⁴C-labelled cholesterol was still present in the liver and viscera, but was not accompanied by higher-counting material. In egg yolk the higher-counting substances were largely replaced by compounds which were also precipitated by digitonin, but showed a lower counting rate than the accompanying cholesterol or were not radio-active. It is considered that these compounds may, nevertheless, be chemically identical with the higher-counting material, since they may have been formed after all the available ¹⁴C-acetate had been used.—G. A. Garton.

See also Absts. 364, 445, 552, 583, 585, 642, 891, 893, 927, 943, 1080.

MINERALS

GENERAL

794

- TOTUSEK, R., PLUMLEE, M. P., PERRY, T. W. and BEESON, W. M. **Absorption and utilization of radioactive charcoal by swine.** *J. Animal Sci.*, 1953, **12**, 611-618. [Dept. Animal Husb., Purdue Univ. Agric. Exp. Stat., Lafayette, Ind.]

Radio-active charcoal from hard and soft woods was given by stomach tube to 4 pigs maintained on an adequate ration. At least 58 per cent. of

the activity was excreted in the faeces within 120 hr., but only traces were detected in the urine. The pigs were slaughtered and traces of activity were found in the liver, kidney, heart, blood and muscle. Readily detected amounts were found in the bones. The radio-activity of the separate elements was not estimated, but it was considered that in the bones two-thirds of the activity was due to Ca and one-third to P. It was concluded that certain mineral elements in charcoal are absorbed and utilised by the pig.—T. D. Bell.

N.A. and R., January 1954

795

NEUMAN, W. F. and NEUMAN, M. W. **The nature of the mineral phase of bone.** *Chem. Rev.*, 1953, **53**, 1-45. [Dept. Radiation Biol., Sch. Med. Dent., Univ. Rochester, N.Y.]

See also Absts. 732, 1278.

CALCIUM AND PHOSPHORUS

796

ENGFELDT, B. **Biophysical studies on bone tissue. 2. The *in vitro* uptake of radioactive phosphate in normal and Paget bone.** *Acta pathol. microbiol. scand.*, 1953, **32**, 529-533. [Dept. Physical Cell Res., Karolinska Inst., Stockholm.]

Thin slices of bone were cut from the long bones of dogs from 1 to 2 years old, killed 3 hr. after receiving 1 mC. radio-active phosphate per kg. bodyweight. The distribution of the radio-active phosphate was studied by autoradiograph. After several months, when the radio-activity of the bone slices had declined to almost nothing, they were incubated with radio-active phosphate *in vitro* and ground somewhat thinner. It could then be demonstrated by autoradiograph that the distribution of the radio-active P in the bone was exactly the same after application *in vitro* as *in vivo*.

Bone slices were taken at autopsy from a patient with Paget's disease. When they were exposed to radio-active P *in vitro* there was a high uptake of P, particularly in those parts of the resorption cavities where new bone tissue was being laid down. It was concluded that results obtained *in vitro* could be accepted as representative of what would happen *in vivo*.—E. M. Hume.

797

NICOLAYSEN, R., EEG-LARSEN, N. and MALM, O. J. **Physiology of calcium metabolism.** *Physiol. Rev.*, 1953, **33**, 424-444. [Nutrit. Res. Inst., Univ. Oslo.]

798

ACKERMANN, P. G. and TORO, G. **Calcium and phosphorus balance in elderly men.** *J. Gerontol.*, 1953, **8**, 289-300. [Div. Gerontol., Med. Sch., Washington Univ., St. Louis, Mo.]

Mixed diets were given to 8 men of 69 to 88 with a mean age of 77 years, and N, Ca and P balance were measured. For N all were positive except in 1 subject for a short period at the beginning of the investigation. For 7 of the men a regression curve was calculated which indicated that 18.5 mg. Ca per kg. bodyweight daily was required for maintaining Ca equilibrium. The eighth subject, whose data were excluded, had a balance of about -1000 mg. Ca daily when intake was 1100 mg. and about -500 mg. even after the intake was

increased to 2000 mg. Ca daily. His X-ray examination showed evidence of osteoporosis. For P the data for all 8 men were used because the subject whose Ca balance was abnormal showed no similar deviation for his P balance; the amount required to maintain equilibrium was found to be 18.7 mg. P per kg. daily.—D. Harvey.

799

BOGDONOFF, M. D., SHOCK, N. W. and NICHOLS, M. P. **Calcium, phosphorus, nitrogen, and potassium balance studies in the aged male.** *J. Gerontol.*, 1953, **8**, 272-288. [Sect. Gerontol., Nat. Heart Inst., Bethesda, Md.]

Seven men aged between 66 and 83 years were the subjects of 2 sets of studies. In the first the diets of 3 contained 107, 859 and 1543 mg. Ca in the 3 periods, all derived from the food; in the second the intakes for 5 subjects, one being re-investigated, were 1600, 292, 816 and 131 mg. Ca in the 4 periods, and only 131 mg. in each diet was from the food supply, the rest coming from added Ca gluconate. Details are tabulated for balances of N, P and Ca and for blood composition in terms of Ca, P, total protein, albumin, globulin and alkaline phosphatase; the second set gives, also, data for K balances and for K in serum.

The K balance and blood composition were unaffected by changes in Ca intake. On the lowest intake of Ca all Ca balances were negative, between -100 and -200 mg. daily. In 2 subjects who had low urinary excretion of Ca during that period there was evidence, when the intake was increased, of more Ca being excreted by the kidneys. If Ca requirement were considered as the level to maintain equilibrium then about 850 mg. daily appeared adequate. Both protein and P intake were high, 13.7 to 17.4 g. N and 1.1 to 2.0 g. P daily and, from the balance data and their bodyweights, the subjects were concluded to have been building protoplasm during the studies. On X-ray examination 2 showed signs of osteoporosis and, with a high Ca intake, their retention of Ca was not much better, indicating, it is suggested, a defect in the mechanism either for building bone matrix or for incorporating Ca in that matrix. [In table 10 the mean Ca balance for subject G.S. should be 94 and not 150 mg.]-D. Harvey.

800

PATTON, M. B., WILSON, E. D., LEICHSENREING, J. M., NORRIS, L. M. and DIENHART, C. M. **The relation of calcium-to-phosphorus ratio to the utilization of these minerals by 18 young college women.** *J. Nutrition*, 1953, **50**, 373-382. [Dept. Home Econ., Ohio Agric. Exp. Stat., Columbus.]

The basal diet contained 344 mg. Ca and 766 mg. P and was given in unsupplemented form or

with additions of 600 or 1200 mg. Ca, each without or with further additions of 300 or 600 mg. P. The extra Ca and P were from CaCO_3 , Ca phosphate, Na phosphate or Na glycerophosphate and Ca : P ratios ranged from 1 : 3.97 to 1 : 0.50. Mean balances ranged from - 46 to + 196 mg. Ca and from - 64 to + 86 mg. P daily. When Ca intake was maintained at any level and P was increased there was no increase in Ca retention, and in P retention there was an increase only when Ca was 900 or 1500 mg. and P intake was 1400 mg. Conversely, when Ca was increased and P was constant there was a significant increase in Ca retention at each level of P, but no effect on P retention.

The indications were that the balances were more closely related to the actual intakes of Ca and P than to the ratios existing between them.

D. Harvey.

801

LEVENSON, S. M., ADAMS, M. A., ROSEN, H. and TAYLOR, F. H. L. **Studies in phosphorus metabolism in man. 3. The distribution, exchange and excretion of phosphorus in man using radioactive phosphorus (P^{32}) as a tracer.** *J. Clin. Invest.*, 1953, **32**, 497-509. [U.S. Army Med. Nutrit. Lab. 9937 TSU-SGO, 1849 W. Pershing Rd., Chicago 9, Ill.]

For earlier work see Abst. 63, Vol. 20.

After a 12-hr. fast, healthy adult males who had been on normal diets received injections of 100 to 200 μC . P^{32} as $\text{Na}_2\text{H}^{32}\text{PO}_4$ into a vein; blood and urine samples were collected at intervals. Some subjects received in addition injections of 25 g. glucose or 0.1 unit insulin per kg. bodyweight 1 hr. after the phosphate injection.

Most of the labelled P left the blood within a few minutes after injection, indicating a very rapid transepillary movement of phosphate. After this initial rapid decrease the rate of disappearance fell. The amount in the red cells increased rapidly in the first 10 or 20 min. and then remained almost constant. Both glucose and insulin accelerated the movement of P^{32} out of the plasma. For 6 subjects the excretion of P^{32} in urine during 1 to 7 hr. after injection averaged 0.8 per cent. of the injected P^{32} per min. It is calculated that the rapidly exchangeable body "phosphorus pool" was about 1.2 g. and that this was turned over about 10 times daily under the conditions of this study. Four hr. after the injection about 95 per cent. of the P^{32} in the plasma was present in inorganic form, the remainder being almost entirely in the acid-insoluble organic form. At peak uptake about 85 per cent. of the P^{32} in the red cells was in inorganic form, but there was a gradual shift from inorganic to organic, so that at 120 hr. after injection about 30 per cent. was in organic form.

W. Godden.

802

MINDER, W. and GORDONOFF, T. **Versuche zur Calcium-Proteinbindung im Blutserum. [Experiments on the binding of calcium to protein in blood serum.]** *Arch. exp. Pathol. Pharmacol.*, 1953, **219**, 485-490. [Radiuminst., Berne.]

Previous experiments (Title 2475, Vol. 22) in which Ca lactobionate labelled with ^{45}Ca was injected into rabbits showed that almost all the ^{45}Ca was precipitated along with the proteins by ethanol. This is confirmed in the present paper with labelled CaCl_2 solution added to human serum *in vitro*. Further experiments with blood taken from a rabbit 5 and 30 min. after injection of labelled Ca lactobionate and fractionated by Cohn's method, and with blood to which labelled Ca lactobionate was added *in vitro* after fractionation, suggested that the Ca rapidly removed from the blood is bound mostly to albumin and to a small extent to α -globulin, and the rest of the Ca to β - and γ -globulin.—W. M. Deans.

803

MÜLLER, E. R. **Zur Frage der Bindung des Calciums im Serum. [On the binding of calcium in serum.]** *Naturwissenschaften*, 1953, **40**, 442. [Med. Klin., Univ. Cologne.]

Blood obtained by heart puncture from rats and mice from 3 hr. to 1 day after they were given CaCl_2 labelled with ^{45}Ca by mouth was subjected to electrophoresis on paper at pH 7.42 and the distribution of radio-activity was followed by Geiger Müller counter.

All the activity was found to be associated with Ca ions, none with serum protein fractions. Similar results were obtained when ^{45}Ca was added to human serum *in vitro*.

It was concluded that the binding of non-ionic Ca, probably to serum protein, is reversible. This agrees with the results of cation exchange experiments by Klement *et al.* (*Naturwissenschaften*, 1953, **40**, 246).—W. M. Deans.

804

VISEK, W. J., MONROE, R. A., SWANSON, E. W. and COMAR, C. L. **Determination of endogenous fecal calcium in cattle by a simple isotope dilution method.** *J. Nutrition*, 1953, **50**, 23-33. [Univ. Tennessee-Atomic Energy Commission, Oak Ridge.]

Three non-pregnant lactating dairy cows and 2 yearling steers were given ^{45}Ca intravenously on 10 successive days. The specific activity of faecal Ca and blood Ca were estimated 4, 5, 6, 7 and 8 days after the last injection and the endogenous faecal Ca was calculated from these data on the assumption that endogenous faecal Ca and total

faecal Ca are in the same ratio as the specific activities of blood Ca and faecal Ca.

The endogenous faecal Ca of the lactating cows was about 7 g. and that of the steers about 4 g. daily. These quantities were not significantly altered by raising the intake of food Ca from normal to high.—R. Hill.

805

MONROE, R. A., VISEK, W. J., SWANSON, E. W. and COMAR, C. L. **Investigations on the secretion of calcium into milk using radioactive tracers.** *J. Dairy Sci.*, 1953, **36**, 590. *Proc.* [Univ. Tennessee, Knoxville.]

806

CLARK, R. **A study of the water-soluble phosphate concentration of the ruminal contents in normal and phosphorus deficient animals.** *Onderstepoort J. Vet. Res.*, 1953, **26**, 137-140. [Onderstepoort Lab.]

A comparison of the concentration of phosphorus in the saliva of sheep, goats, cattle, horses and dogs with that in the blood showed that all the ruminant species and, to a less extent, the horse concentrated P. This was most marked with sheep. The concentration of P in the rumen of sheep was less than that of the saliva, but there was no difference between the P concentrations of the rumen in sheep on normal diet and P-deficient sheep, although in the latter both blood and salivary P were reduced. This was true also for normal and P-deficient cattle. Most of the P was absorbed from the small intestine in cattle; the concentration does not fall until below the duodenum.—A. T. Phillipson.

807

LIU, C. H. and McCAY, C. M. **Studies of calcium metabolism in dogs.** *J. Gerontol.*, 1953, **8**, 264-271. [Nutrit. Lab., Animal Husb. Dept., Cornell Univ., Ithaca, N.Y.]

Experiments with young dogs showed that between 14 and 20 weeks of age there was a fall in the percentage of Ca retained from the diet and that when Ca intake was low the balance might be negative. A diet was devised which provided only 4 to 8 mg. Ca per kg. daily. When this was given to dogs between 6 and 25 weeks of age all balances were negative and there was no particular age at which losses were at a minimum. Young dogs were found to retain Ca as well from CaSO_4 as from milk.

Experiments with old dogs of 6 to 15 with mean age 9 years, with intakes from 8 to 477 mg. per kg. daily, showed difficulty in maintaining equilibrium when less than 86 mg. Ca was supplied. For them there was evidence that a diet with 40 per cent.

fat caused a greater loss of Ca than one with 5 per cent. fat and that exercise had a slight favourable influence on Ca retention.—D. Harvey.

808

TOMLIN, D. H., HENRY, K. M. and KON, S. K. **Autoradiographic studies of calcium metabolism in bones and teeth.** *Proc. Nutrit. Soc.*, 1953, **12**, iv. [Dept. Phys. Res., Univ. Reading.]

809

HODGES, P. C. (Jr.) **Ossification in the fetal pig. A radiographic study.** *Anat. Rec.*, 1953, **116**, 315-325. [Dept. Anat., Univ. Wisconsin, Madison.]

810

FOURNIER, P. **L'absorption du calcium chez le rat adulte. 3. Influence de l'état initial de l'animal. [Absorption of calcium by the adult rat. 3. Effect of the initial state of the animal.]** *C.R. Acad. Sci.*, 1953, **236**, 2537-2539.

For previous work see Abst. 2317, Vol. 21.

Adult male rats in 2 groups of 6 received, for 2 days or 3 weeks, a diet providing not more than 0.01 per cent. Ca and then a supplement of 1 per cent. CaCO_3 and 1 per cent. TiO_2 , replacing starch. The TiO_2 served as a marker for calculation of the coefficient of absorption of Ca. After only 2 days of Ca deprivation mean Ca absorption was 7 mg. daily, and this remained constant. In the other group the mean absorption was 36 mg. on the first day of Ca supplementation and decreased until the seventh day, when it reached the constant level of the first group. This pronounced but brief increase in Ca absorption suggests rapid re-mineralisation of insufficiently calcified bone.—D. Duncan.

811

SUR, B. K. and SUBRAHMANYAN, V. **Availability of calcium in lucerne and its value in nutrition.** *Indian J. Med. Res.*, 1952, **40**, 481-486. [Central Food Technol. Res. Inst., Mysore.]

At weaning 28 rats were divided into 4 groups; those in one group were killed and found to contain 0.7 ± 0.006 g. Ca per 100 g. bodyweight. The other 3 groups received diets in which the content of 0.34 per cent. Ca was provided by whole milk powder, dried alfalfa or dried amaranth. These rats were killed after 4 weeks, and Ca intake and retention were estimated. The utilisation factor for Ca from whole milk powder was 0.81 ± 0.023 , from alfalfa 0.76 ± 0.022 and from amaranth 0.14 ± 0.049 . The percentages of Ca in the body were 0.88 ± 0.014 , 0.84 ± 0.008 , and 0.66 ± 0.05 , respectively. Rats on the amaranth diet made poor growth, and their food intakes decreased during the last 2 weeks.—D. Duncan.

812

ARMSTRONG, R. H., THOMAS, B. and HORNER, K.
The availability of calcium in three herbs of grassland. *J. Agric. Sci.*, 1953, **43**, 337-342.
 [King's Coll., Newcastle upon Tyne.]

Rats were used to estimate the availability of Ca in samples of burnet (*Poterium sanguisorba*), chicory (*Cichorium intybus*) and narrow-leaved plantain (*Plantago lanceolata*).

The samples contained, respectively, 1.79, 2.34 and 3.28 per cent. Ca on a dry matter basis and the percentages utilised were 80.38, 87.73 and 95.28. There was some evidence of inverse relationship between Ca availability and the contents of fibre and oxalic acid.—P. C. Jowsey.

813

NAKAJIMA, T. and OTSUKA, J. [On the influence of calcium citrate upon calcium metabolism.] *Bull. Nat. Inst. Agric. Sci., Chiba* [G], 1953, No. 6, 21-27. In Japanese: English summary.

On a diet of unpolished rice with supplements of sodium citrate, calcium citrate or calcium carbonate, female albino rats on the calcium citrate supplement showed the greatest growth and Ca deposition in bone. In rabbits on a rice- and wheat-bran diet with a supplement of sodium citrate the retention of Ca was greater than with a supplement of either sodium carbonate or citric acid. This effect was attributed to the Na ions. With a supplement of calcium citrate the amount of Ca in bone was greater than in animals receiving calcium carbonate. It is suggested that calcium citrate is a better supplement to a Ca-poor ration than calcium carbonate. (From summary.)

J. S. Thomson.

814

TOMLIN, D. H., HENRY, K. M. and KON, S. K.
Autoradiographic study of growth and calcium metabolism in the long bones of the rat. *Brit. J. Nutrition*, 1953, **7**, 235-252. [Dept. Phys., Univ. Reading.]

Rats received a high-Ca diet for 30 days and then a low-Ca diet containing radio-active Ca for up to 113 days. Groups of rats were killed at intervals of about 2 weeks. In a second experiment rats were given the high-Ca diet for 27 days, then half received the high-Ca diet and the others the low-Ca diet. Radio-active Ca was given to these rats from 27 to 107 and from 218 to 301 days and groups of animals were killed at intervals of about 15 weeks.

Autoradiographs were prepared of longitudinal sections of humerus and femur from these animals, and specific activities of different parts of the bones were derived from optical density measurements made with a microphotometer. About 24 per cent. of the Ca in cortical bone was exchange-

able, and this amount was exchanged in about 90 days.

Growth and remodelling by deposition and resorption in different parts of the humerus and femur were described from the autoradiographs.

The low-Ca diet allowed less growth in length and there was difference in the development of the distal diaphysis of the femur. The diameter of the shaft was reduced but normal cortical thickness was maintained.—R. Hill.

815

KARCHER, H. Der Calcium- und Phosphorstoffwechsel bei der normalen und gestörten Knochenbruchheilung sowie in frischen und konservierten Transplantaten. Ein Nachweis mit den radioaktiven Isotopen P^{32} und Ca^{45} . [Calcium and phosphorus metabolism in normal and pathological healing of fractures and in fresh and preserved transplants, demonstrated with the radio-active isotopes ^{32}P and ^{45}Ca .] *Langenbecks Arch. klin. Chir.*, 1953, **275**, 1-49. [Chirurg. Klin., Univ. Heidelberg.]

The uptake of ^{45}Ca and ^{32}P and their spatial distribution at different stages of healing were studied by 1600 measurements with a counter and 100 autoradiographs with rats whose upper or lower leg bones or metatarsi had been fractured. The animals received an intraperitoneal injection of ^{32}P as sodium dihydrogen phosphate or of ^{45}Ca as Ca lactate at the time of the fracture.

In the first 3 days after fracture the ^{32}P content of the fractured bone was lower than that of the control in the opposite limb, but from the fourth day there was a rapid rise in deposition which, in the upper and lower leg bones, attained a maximum 9 to 11 days after fracture. The uptake of ^{45}Ca followed the same course but was slightly delayed, maximum values being attained 13 to 15 days after fracture. Deposition of the isotopes proceeded for about 4 days longer in the upper than in the lower leg bones. Thereafter the isotope content decreased slowly but was detectable even after 50 days. Metabolic activity of the fractured as compared with the control bone was high both close to the fracture and in the end sections of the bone. An examination of the whole skeletons of some animals during the healing period gave no clear evidence of any general rise in Ca and P metabolism.

In bones with retarded healing of fractures there was a marked reduction of isotope content compared with that of bones healing normally, owing probably to a disturbance in formation of the organic matrix, not to any lack of minerals.

Tests of substances, such as sex and other hormones and certain vitamins, frequently recommended for use as promoters of fracture healing did not show increased deposition of isotopes or

any influence on the bone metabolism if the animals were maintained on an adequate, well-balanced diet.

Experiments with dogs in which fresh bone transplants from another limb were made on to a fractured leg bone showed an increased uptake of ^{32}P in the transplant commencing on about the 20th day after fracture and lasting until the end of the fourth month. The simultaneous building up and breakdown processes in the transplant were clearly seen in radioautographic pictures. The ^{32}P uptake was less in homoplastic than in autoplastic transplants. Preservation of transplants under sterile conditions at 0°C . for 90 days or more before fixation to bone or implantation under the skin resulted in reduced uptake of ^{32}P , but the difference between the two types of transplant was less.—W. Godden.

816

NAKAJIMA, T., ŌMORI, S., ŌTSUKA, J., NOZAKI, H. and NAGAHATA, S. [Phosphorus metabolism in rabbits suffering from so-called osteomalacia.] *Bull. Nat. Inst. Agric. Sci., Chiba [G]*, 1953, No. 6, 37–42. In Japanese; English summary.

Three groups of rabbits were used: (1) showing osteomalacia on a diet of rice- and wheat-bran, (2) a healing group receiving a supplement of calcium citrate, and (3) a control group on the bran diet with calcium carbonate. About $30\ \mu\text{C}$. ^{32}P were given orally to all groups and radioactivity in the bones, urine, whole blood P and serum inorganic P was estimated at 12 or 24 hr.

Compared with groups 2 and 3, group 1 excreted relatively large amounts of ^{32}P in the urine, its specific activity decreasing with time. There was a marked increase in the deposition of P in the bone at the healing stage. Changes in radioactivity in blood P and serum inorganic P are discussed. (From summary.)—J. S. Thomson.

817

SATO, T. Effects of parotid gland extract upon calcification of dentin of rabbit. *Gunma J. Med. Sci.*, 1953, 2, 183–185. [Dept. Maxillo-stomatol., Sch. Med., Gunma Univ., Maebashi.]

An extract of parotid gland was given to rabbits in a single injection of 5 or 10 mg. per kg. intravenously, or of 15, 25 or 50 mg. per kg. subcutaneously. The effect on dentine formation was studied by marking the time of injection by intravital staining with lead and later examining the regularity of intensity of staining with haematoxylin. The extract was found to have an effect both quantitative and qualitative, irrespective of the route. Small doses accelerated dentine formation, medium doses first accelerated but later slowed formation and large doses hindered it.—D. Harvey.

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818

JOWSEY, J. R., OLIVER, W. F., MAW, W. A. and COMMON, R. H. Observations on the mineral metabolism of pullets. 10. The effects of gonadal hormones on retention and turnover of calcium by the skeleton. *Canad. J. Agric. Sci.*, 1953, 33, 216–224. [Fac. Agric., McGill Univ., Macdonald Coll., Que.]

Immature pullets which had received injections of androgen, oestrogen or both during a Ca balance experiment (Abst. 4700, Vol. 23) were given radioactive Ca in food and were killed 24 hr. later.

Net gain of Ca by the skeleton and turnover of skeletal Ca were both increased to a highly significant degree by oestrogen and androgen together. Ca uptake by the skeleton was decreased by oestrogen and turnover was increased by androgen.

The possible reactions involved in the interaction of oestrogen with androgen are discussed in the light of evidence obtained in this and in previous experiments.—R. Hill.

819

WEBSTER, R. A. and WARD, T. G. The dispersion of radioactive phosphorus in the embryonated hen's egg. *Arch. Biochem. Biophys.*, 1953, 45, 384–396. [Dept. Microbiol., Sch. Hyg. Pub. Health, Johns Hopkins Univ., Baltimore, Md.]

820

STEARMAN, R. L., WARD, T. G. and WEBSTER, R. A. A statistical estimate of variation encountered in studying dispersion of radioactive phosphorus in embryonated chicken eggs. *Arch. Biochem. Biophys.*, 1953, 45, 397–410. [Dept. Biostatistics, Johns Hopkins Univ., Baltimore, Md.]

See also Absts. 239, 323, 349, 360, 407, 564, 586, 647, 652, 899, 918.

MAGNESIUM

See Abst. 828.

SODIUM, POTASSIUM, AND SODIUM CHLORIDE

821

DUNCAN, L. E. (with PONDER, K.) Effect of edema and dietary sodium on efficacy of sodium removal by cation exchange resin. *Amer. Heart J.*, 1953, 45, 802–808. [Sect. Gen. Med., Nat. Heart Inst., Nat. Insts. Health, Bethesda, Md.]

Two patients who had congestive heart failure with oedema and 1 normal subject were studied. With a diet low in Na, less than 40 m. equiv. daily, the patients were given doses of 120 m. equiv. Resodac 3 times daily and uptake of Na by the resin was estimated while oedema persisted.

Diuresis was then induced and when the patients were free from oedema the uptake was again estimated, after which dietary Na was increased to 122 m. equiv. daily for the third estimation. The normal subject had the same amount of resin first with a high-Na diet, 198 m. equiv. daily, and later with a further 300 m. equiv. Na daily by intravenous injection.

While the patients had a low Na intake the uptake of Na by resin, high when oedema was present, decreased with the oedema. When their Na intake was increased the uptake by resin remained low so long as there was no oedema and increased only when an appreciable amount of oedema had returned. In the normal subject, whose extracellular fluid volume was unaffected, the uptake of Na by resin became greater when the Na intake was increased.—D. Harvey.

822

NADLER, C. S. **Recent advances in potassium metabolism.** *Amer. J. Med. Sci.*, 1953, **226**, 88-103. [Dept. Med., Sch. Med., Tulane Univ., New Orleans, La.]

A review with 131 references.

823

RYSSING, E. **Kaliumudskillelsen i urinen under vandbelastning. [Excretion of potassium in the urine after drinking water.]** *Nord. Med.*, 1953, **50**, 1158-1159. [Børnehosp., Martinsvej, Copenhagen.] English summary.

824

MACPHEE, I. W. **Some apparent anomalies of potassium metabolism.** *Brit. Med. J.*, 1953, **ii**, 528-531. [Univ. Liverpool.]

Experimental and clinical contributions to the literature on K deficiency and excess are reviewed. Clinical states of K deficiency are considered, especially those in which there is urinary loss of K. The mechanism leading to such loss in widely different conditions is not fully understood. Diagnosis of K deficiency is hampered by the fact that serum K may be normal while there is considerable cellular K depletion. Electrocardiographic evidence is helpful. Signs of K intoxication are directly related to extracellular K concentrations, and in parenteral K therapy for K deficiency serum K should be kept under observation throughout treatment.—F. C. Aitken.

825

ELMAN, R., SHATZ, B. A., KEATING, R. E. and WEICHELBAUM, T. E. **Intracellular and extracellular potassium deficits in surgical patients.** *Ann. Surg.*, 1952, **136**, 111-131. [Sch. Med., Washington Univ., St. Louis, Mo.]

826

RUSKIN, A. and RUSKIN, B. **Effect of potassium depletion in essential hypertension.** *Amer. J. Med.*, 1953, **14**, 758. *Proc. [Dept. Med., Univ. Texas Med. Branch, Galveston.]*

827

DE JONGH, C. L. **Geneesmiddelen die een tekort aan kalium kunnen veroorzaken. [Drugs that may induce a deficiency of potassium.]** *Nederland. Tijdschr. Geneesk.*, 1953, **97**, 1678-1682. [The Hague.]

A lecture.

828

KUNKEL, H. O., BURNS, K. H. and CAMP, B. J. **A study of sheep fed high levels of potassium bicarbonate with particular reference to induced hypomagnesemia.** *J. Animal Sci.*, 1953, **12**, 451-458. [Dept. Biochem. Nutrit., Texas Agric. Exp. Stat., College Station.]

Thirty adult Rambouillet ewes weighing from 70 to 100 lb. were provided for a pre-experimental period of 3 weeks with a basal diet of cottonseed hulls 50, ground milo grain 30 and soya bean meal 20 per cent. This diet, supplemented with vitamin A, was given at a rate of up to 4 lb. daily, with free access to a mixture of salt and bonemeal. The diet of 22 of the ewes was then altered to include 5 per cent. added K as the bicarbonate. Other differences in treatment of the 22 ewes did not influence the main effects on blood as shown by analyses made after 12, 48 and 62 days on the high K intake. After 62 days mean serum Mg among the high-K ewes was 1.84 mg. per 100 ml. (S.D. 0.24) compared with 2.65 (S.D. 0.21) among controls still receiving the basal diet. The high-K diet had no significant effect on serum Ca, K, Na or total protein. There was no evidence of clinical Mg deficiency, although a transient mild hypersensitivity (increased excitability and polypnoea on exertion) was noted after 48 days in a group receiving a low-salt, high-K diet. Feed intake and rate of gain were decreased by the incorporation of KHCO_3 in the diet.—A. N. Worden.

829

KANTER, G. S. **Excretion and drinking after salt loading in dogs.** *Amer. J. Physiol.*, 1953, **174**, 87-94. [Dept. Physiol., Sch. Med. Dent., Univ. Rochester, N.Y.]

830

BRENNER, W. and BIRK, W. **Experimenteller Beitrag zum Kaliumstoffwechsel. [Experimental study of potassium metabolism.]** *Ztschr. Kinderheilk.*, 1953, **73**, 251-264. [Kinderklin., Univ. Bonn.]

Electrocardiographic observations on rabbits in which shock had been induced by intraperitoneal injections of veratrine showed that the changes accepted as typical for low blood K were found also associated with high blood K. Thus plasma K has no direct influence on the electrocardiographic changes and such changes cannot give a sure indication of the necessity for therapeutic administration of K.—M. B. Richards.

831

MUNTWYLER, E., GRIFFIN, G. E. and ARENDS, R. L.
Muscle electrolyte composition and balances of nitrogen and potassium in potassium-deficient rats. *Amer. J. Physiol.*, 1953, **174**, 283-288. [Dept. Biochem., State Univ. New York Coll. Med., Brooklyn.]

Mature male rats were fed on diets deficient in K or protein or both. Liveweight changes, N and K balances and the electrolyte composition of plasma and skeletal muscle were studied.

In the absence of K, growth and N retention were reduced, indicating disturbed N metabolism; skeletal muscle contained less K and more Na than normally. When both K and protein were low the disturbance in N metabolism was more serious, but the electrolyte composition of muscle was normal.

Re-feeding with protein after a period of low dietary K and protein did not improve N metabolism, but a rapid fall in muscle K took place, and it was calculated that the amount lost from muscle was greater than that lost from the body as a whole; redistribution of K had apparently taken place.—R. Hill.

832

CANNON, P. R., FRAZIER, L. E. and HUGHES, R. H.
Sodium as a toxic ion in potassium deficiency. *Metabolism*, 1953, **2**, 297-312. [Dept. Pathol., Univ. Chicago, Ill.]

Adult rats depleted with low-protein diets and afterwards subjected to protein repletion on diets devoid of K developed the myocardial lesions characteristic of K deficiency. The severity of the lesions increased with Na intake and their development could be prevented, even in prolonged K deficiency, by a low-Na diet. NaCl was rapidly and lethally toxic in animals suffering from severe K depletion, and it is suggested that this toxicity may be a consequence of the reciprocal intracellular relationship of Na and K. The cardiac lesions which developed in rats given a low-K high-Na diet differed considerably from the so-called K-deficiency necroses. It may be that under conditions of K depletion the excessive intracellular accumulation of Na injures the intracellular enzyme activities, initiating coagulative necrosis.

M. B. Richards.

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833

MENEELY, G. R., TUCKER, R. G., DARBY, W. J. and AUERBACH, S. H. **Chronic sodium chloride toxicity in the albino rat. 2. Occurrence of hypertension and of a syndrome of edema and renal failure.** *J. Exp. Med.*, 1953, **98**, 71-80. [Radioisotope Unit, Thayer Veterans Admin. Hosp., Nashville, Tenn.]

For part 1 see Abst. 3270, Vol. 23. The groups of rats used in those experiments were maintained on the high-salt diets until they died or were killed, or for 14 months.

In the third month oedema occurred among rats in the 3 groups eating 7.0 to 9.8 per cent. salt, and by the sixth month 16 of these 90 rats had died or been killed because of oedema or subsequent cachexia. All were found to have spectacular kidney lesions. In a small number which survived only 6 to 9 months, but did not become oedematous, there were also widespread kidney and vascular lesions.

After 14 months nearly all the remaining rats in the 3 high-salt groups and most of those receiving 2.8 and 5.6 per cent. salt had significantly raised blood pressure, and those which were killed showed renal and arterial lesions. The average systolic blood pressure showed a linear relation to the amount of salt in the diet, with coefficient of correlation $+0.91 \pm 0.08$.—D. Duncan.

834

BURNS, C. H., CRAVENS, W. W. and PHILLIPS, P. H.
The sodium and potassium requirements of the chick and their interrelationship. *J. Nutrition*, 1953, **50**, 317-329. [Dept. Biochem., Coll. Agric., Univ. Wisconsin, Madison.]

Chickens from 1 to 18 days old received for up to 4 weeks diets which contained 0.02 to 1.50 per cent. Na and 0.11 to 1.50 per cent. K. Growth was poor and mortality was high when both elements were at low levels, or when there was a wide difference between them, even when the low element was at a level which could, with suitable levels of the other, give good growth without high mortality. When both elements were present at high levels growth was good but not quite maximum.

The Na requirement was found to be between 0.10 and 0.30 and that for K between 0.23 and 0.40 per cent., the higher levels being required when other conditions permitted maximum growth.

The requirement for Cl, 0.06 per cent., was less than equivalent to the Na required.—R. Hill.

HALOGENS

835

JENKINS, G. N. and SPEIRS, R. L. **Distribution of fluorine in human enamel.** *J. Physiol.*, 1953, **121**, 21P-22P. [Dept. Physiol., Med. Sch., King's Coll., Newcastle upon Tyne.]

836

FLEMING, H. S. Effect of certain concentrations of fluoride on enamel and dentin as formed in transplants of tooth germs and related studies. *J. Dent. Res.*, 1953, **32**, 469-485. [Dept. Pathol., Sch. Med., Yale Univ., New Haven, Conn.]

Fluorine, as CaF_2 or NaF in drinking water or by injection, was given to guineapigs and mice which had received embryonic tooth germs or lung tissue as intracerebral, intra-ocular or axillary transplants. The effects of F on ameloblasts of incisors were studied also in rats without such transfers. Methylcholanthrene was given to some animals with or without F.

The expected calcification of enamel and dentine after they had been formed in the germs was delayed by F. Ameloblasts failed to keratinise even in the presence of methylcholanthrene. The amounts of F used were considered too small to have ionic effects and were thought to have affected carbohydrate utilisation in cells with high energy requirements and to have interfered with transport of metabolites across the cell membrane. The possibility that fast-growing spontaneous mouse tumours may be similarly influenced by F is being investigated.—D. Harvey.

837

WADHWANI, T. K. and RAMASWAMY, A. S. Pathological changes in the tissues of rats (albino) and monkeys (*Macaca radiata*) in fluorine toxicosis. *J. Indian Inst. Sci.* [A], 1953, **35**, 223-230. [Sect. Pharmacol., Dept. Biochem., Indian Inst. Sci., Bangalore 3.]

Twelve albino rats 5 to 6 weeks old were fed on cottonseed globulin 9, gelatine 4, nitrogen-free starch 65, salts 4, choline hydrochloride in sugar (1:9) 1, cystine in sugar (1:19) 1, and vegetable fat 16 per cent., with vitamins A, D and B complex; half the rats were given, one hour before food was offered, 2 mg. NaF in water by mouth daily for 20 weeks.

Four male monkeys, *Macaca radiata*, were each given at 9 a.m. 50 g. bread, 2 mg. ascorbic acid, and shark oil containing 100 units vitamin A and 30 units vitamin D, at noon 50 g. cake made from wheat flour 61, casein 15, sugar 5, salts 4, and fat 10 per cent., and at 4 p.m. 25 g. groundnuts. NaF , 10 mg. per kg. bodyweight, was given by mouth to 2 monkeys at 8 a.m. for 24 weeks.

Histological study of the fluoride-fed rats and monkeys showed degeneration of the epithelium and atrophy of the glands of the stomach; destruction of the epithelium and lymphocytic infiltration of the duodenum and small intestine; degeneration and necrosis of the tubules and atrophy of the glomerulus of the kidney; centrilobular necrosis of the liver; fibrosis in spleen and lung;

degeneration of islet cells and glandular cells of the pancreas; degeneration and pigmentation of adrenal; atrophy of the thyroid and chromatolysis and fibrosis in the cerebral cortex. No change was observed in the heart muscle, aorta, parathyroid or skin. The changes were more severe in the monkeys than in the rats.—J. M. Naftalin.

838

OGILVIE, A. L. Histologic findings in the kidney, liver, pancreas, adrenal, and thyroid glands of the rat following sodium fluoride administration. *J. Dent. Res.*, 1953, **32**, 386-397. [Div. Dent. Med., Sect. Oral Pathol., Univ. California Coll. Dent., San Francisco.]

839

TOWERY, B. T. The physiology of iodine. *Bull. World Health Organiz.*, 1953, **9**, 175-182. [Dept. Med., Sch. Med., Vanderbilt Univ., Nashville, Tenn.] French summary.

A review.

840

STANBURY, J. B. Preliminary studies of iodine metabolism in patients from an area of endemic goitre. *Bull. World Health Organiz.*, 1953, **9**, 183-196. [Dept. Med., Harvard Med. Sch., Boston, Mass.] French summary.

The metabolism of the thyroid was studied in 126 goitrous patients from Mendoza in the Argentine, mostly young and having hyperplastic thyroids. Radio-active ^{131}I was administered daily. The peak concentration in the thyroid was often reached within 6 hr., whereas in normal subjects 24 hr. or more were needed. In iodine-deficient regions or areas of endemic goitre, daily renal excretion was 15 to 40 μg ., compared with 100 to 200 μg . in areas without goitre. Ingestion of a goitrogenic substance hindered the uptake of ^{131}I , prevented its utilisation and increased renal excretion. When thyrotropic hormone was administered with the goitrogen the retention of ^{131}I was still further reduced. The tests which were most helpful for the study of goitre prophylaxis were those in which doses of 150, 500 and 1500 μg . ^{131}I were given daily to different patients. The avidity of the thyroid for ^{131}I diminished as the dose increased and iodine balances became positive. One case of thyrotoxicosis occurred after treatment for 32 days with 1500 μg . daily. In 21 patients the addition of stable iodine (^{127}I) showed little effect on the uptake of ^{131}I until the level of 1500 μg . ^{127}I was reached, when the uptake of ^{131}I was depressed. This meant that the proportion of a dose of ^{127}I which was retained depended on the quantity administered. When more than 5 mg. I was given in a dose most of it was wasted.

B. W. Simpson.

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841

TAYLOR, S. **An autoradiographic study of simple goitre.** *Bull. World Health Organiz.*, 1953, **9**, 197-210. [Postgrad. Med. Sch., London.] French summary.

Simple goitre was studied in 60 patients; none showed evidence of toxicity or malignancy and all were clinically euthyroid. They were given 100 μ C. ^{131}I in 100 ml. water to drink while fasting. The ^{131}I was estimated in urine and in the thyroid by Geiger Müller counter. Forty-eight hours after ingestion of the ^{131}I , partial thyroidectomy was performed, usually because of pressure on the trachea or oesophagus. Autoradiographs were prepared and it was found that the areas which were active were the small follicles and that the large follicles were mostly inactive. These autoradiographs showed ^{131}I metabolism at only one stage, and an attempt was made to reconstruct the evolution of the disease from all the material. A diffuse hyperplastic gland seemed to be the initial stage, and it developed into a gland with groups of small active follicles or with one large group of active follicles or a nodule. These active nodules then became haemorrhagic and necrotic and finally completely inactive. It is suggested that either a low I intake or the consumption of goitrogenic substances or both may be the cause of goitre; lack of I is not always the only cause.—B. W. Simpson.

842

MURRAY, M. M. **The effects of administration of sodium iodate to man and animals.** *Bull. World Health Organiz.*, 1953, **9**, 211-216. [Bedford Coll., Univ. London.] French summary.

Toxicity tests with sodium iodate were made to study the feasibility of using iodate instead of iodide for iodising salt, when crude moist impure salt was the only kind available or where environmental conditions caused loss of iodine from the salt during storage. In long-term tests 7 rabbits, 6 weeks old, were given 1 mg. sodium iodate per kg. bodyweight twice weekly by mouth; 2 were killed after 4 months and 5 after 8 months. All had been in good health, ate well and gained weight. Their offspring were given by mouth 1 mg. sodium iodate per kg. bodyweight twice weekly from the age of 2 months; 3 were killed after 5½ months, 2 after 7 months and 2 were still alive after 14 months. All the animals had maintained good health. The long-term tests provided still more conclusive evidence of the safety of using iodate for salt iodisation. No toxic sign was seen in several thousands of sheep which licked iodated salt at the rate of 7 mg. iodate weekly for 5 months. Iodisation with iodate at the level of 1 part sodium iodate in

20,000 parts NaCl means a weekly intake in man of 3.5 mg. sodium iodate for 70 g. salt, or 2.2 mg. iodine, on the basis of a daily consumption of 10 g. salt. The iodine of iodates was taken up by the thyroid gland slightly more slowly than the iodine of iodides. It is not suggested that iodate should be employed universally, but only when there is excessive loss of iodine from salt iodised with iodide.—B. W. Simpson.

See also Abst. 1408.

IRON AND COPPER

843

BURGIO, G. R. and LO JACONO, F. **La sideremia nell'anemia perniciosiforme del lattante.** [Blood iron in pernicious anaemia of infants.] Modificazioni della transferrina a seguito di somministrazione di preparati di ferro in bambini sani ed emopatici. [Modifications of transferrin after administration of iron preparations in healthy children and children with diseases of the blood.] *Bull. Soc. ital. Biol. sper.*, 1952, **28**, 1948-1950; 1950-1952. [Clin. Pediat., Univ. Palermo.]

Iron was estimated in the serum of 14 infants with megaloblastic anaemia. The values were high, ranging from normal values, taken as from 60 to 90 μg . per 100 ml., to 315 μg . per 100 ml. Unsaturated transferrin also was estimated in the serum of 8 of the babies, and values both above and below the normal were found. When treatment was given with vitamin B₁₂ or folic acid, serum Fe fell to about half within 48 hr. The transferrin values were not modified greatly or consistently.

Fe was injected as colloidal Fe saccharate in a dose of 1 mg. Fe per kg. bodyweight or was given orally as ferrous sulphate, 2 mg. Fe per kg. Serum Fe and unsaturated transferrin were estimated before and after. In 4 normal children aged from 7 months to 7 years, the amount of unsaturated transferrin fell after the injection till sometimes none could be found, whether the Fe was injected or given orally. Tests were made also on 3 babies with Cooley's anaemia and on 5 with hypochromic anaemia. The results were not uniform; in some the effect was the same as in normal babies, but in others the amount of unsaturated transferrin rose.—E. M. Hume.

844

GOLDECK, H. and REMY, D. **Über die Abwanderungsgeschwindigkeit des Eisens nach intravenösen Eisen^{III}-Gaben.** [Rate of dispersion of iron after intravenous administration of ferric iron.] *Klin. Wochenschr.*, 1953, **31**, 608-612. [2. Med. Klin., Univ. Hamburg, Eppendorf.]

845

CLOSUIT, M., GOVAERTS, J. and LAMBRECHTS, A. Contribution à l'étude du métabolisme du fer à l'aide du radiofer ^{59}Fe . [Study of the metabolism of iron by the use of ^{59}Fe .] 1. Quelques données nouvelles sur l'élimination rénale du fer. [1. New data on excretion of iron by the kidney.] 2. Utilisation du radiofer pour l'étude des échanges de fer au niveau du tractus digestif. [2. Use of radio-active iron for studying iron metabolism in the digestive tract.] *Arch. internat. Physiol.*, 1953, **61**, 306-317; 318-322. [Clin. Malad. Enfance, Univ. Liège.]

1. Dogs were narcotised with chloralose and the ureters were cannulated. Labelled ferric citrate was injected intravenously.

There was a pronounced increase in excretion of Fe, directly proportional to the amount injected, during the first few minutes after injection, but after 10 to 20 min. it decreased somewhat and became constant. There was some increase in urine volume, but production of diuresis did not increase Fe excretion. Serum Fe decreased abruptly during the initial excretion and the 2 curves stabilised at about the same time. Rate of excretion thus depended upon serum concentration.

2. The same dogs were killed $1\frac{1}{2}$ hr. after injection of Fe and were perfused with physiological saline. The digestive tract and liver were removed for analysis.

The specific activity was highest in the liver, followed by the duodenum, small intestine, colon and stomach.—D. Duncan.

846

SILBER, D. F. and GORDON, A. S. The influence of starvation and the adrenal upon iron storage in the rat. *J. Clin. Endocrinol.*, 1953, **13**, 844-845. *Proc.* [Dept. Biol., Washington Square Coll. Arts. Sci., Univ. New York.]

847

HAMPTON, J. K. (Jr.) and KAHN, J. B. (Jr.) Uptake and storage of radioactive iron by mouse liver. *Amer. J. Physiol.*, 1953, **174**, 226-230. [Dept. Physiol., Sch. Med., Tulane Univ., New Orleans, La.]

Male mice were injected with radio-active iron, ^{59}Fe , and were killed at specified times afterwards and the livers were analysed. The Fe present was fractionated into haemosiderin-rich, HRF, and ferritin-rich, FRF, fractions and from the latter was obtained a ferritin fraction, FF.

Doses of 10.5 to 104.8 μg . ^{59}Fe were injected into a group of mice and all were killed 15 hr. afterwards. As the dose increased, the proportion of it found in the liver increased, but the ratio

FF : HRF was almost constant at unity, although the ^{59}Fe content of the liver varied from 4.3 to 68.4 μg .

Several groups of mice were given approximately 65 μg . of ^{59}Fe and were killed at intervals from 1 to 48 hr. after injection. The FF : HRF ratio in the liver increased from 0.46 at 1 hr. to a maximum of 1.34 at 11 hr., and remained at this value, at least until 48 hr.—R. Hill.

848

STEVENS, A. R. (Jr.), WHITE, P. L., HEGSTED, D. M. and FINCH, C. A. Iron excretion in the mouse. *J. Biol. Chem.*, 1953, **203**, 161-165. [Dept. Med., Sch. Med., Univ. Washington, Seattle.]

Mice received a normal diet with or without added Fe. Some on the normal diet received additional Fe by intravenous injection. Radio-active Fe was injected intraperitoneally and some animals were killed every 4 weeks thereafter. Radio-active Fe was estimated in the whole carcass and in separate tissues.

The fall in ^{55}Fe in the carcass was similar in "iron-heavy" mice to that in mice with normal body stores. The fall in ^{55}Fe was exponential, and about 50 per cent. was lost in 140 days.

In animals made "iron-heavy" the largest fraction of ^{55}Fe was in the liver, but in those with normal body stores the largest fraction was in the blood.—R. Hill.

849

WYATT, J. P. and HOWELL, J. Experimental induction of iron overload in the rat. 1. Morphological alterations due to dietary siderosis. *Arch. Pathol.*, 1953, **55**, 466-474. [Dept. Pathol., Sch. Med., Univ. St. Louis, Mo.]

Groups of 5 or 10 white male rats of initial weight between 63 and 117 g., average 83 g., were fed to appetite on maize grits and lard, or on Purina chow, each with or without 2 per cent. ferric citrate. Half the rats were castrated. After 72 days half the rats were given a supplement of 0.5 per cent. powdered copper acetate.

Rats fed on maize grits lost weight, becoming grossly emaciated; the addition of Cu acetate led to further deterioration and the rats died. The rats fed on chow and ferric citrate grew less rapidly than those fed on chow alone.

Histologically, at 72 days, in the rats fed on maize grits and ferric citrate, Fe was seen to be deposited at the periphery of the liver lobule, in maximum amounts in the Kupffer cells and to a less extent in the liver cells and histiocytes. Giant cells were occasionally seen. At 128 days Fe was present in the liver cells in all parts of the lobule. The Kupffer cells and giant cells were larger. The addition of Cu acetate to the diet increased Fe

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deposition. Castration had no effect on Fe deposition. No necrosis or fibrosis was found. The livers of the rats fed on chow with or without added ferric citrate, or on maize grits without citrate, showed only a little deposition of Fe in the Kupffer cells at the periphery.

In rats fed on diets containing ferric citrate, Fe was found in the macrophages round the malpighian bodies of the spleen, and in the inner core of Fleming's germinal centres of abdominal lymph glands. Small amounts of Fe were occasionally found in the cells of the proximal tubules of the kidney in rats fed on maize grits and Fe.

J. M. Naftalin.

850

WINTROBE, M. M., CARTWRIGHT, G. E. and GUBLER, C. J. **Studies on the function and metabolism of copper.** *J. Nutrition*, 1953, **50**, 395-419. [Dept. Med., Coll. Med., Univ. Utah, Salt Lake City.]

A review.

851

VAN WYK, J. J., BAXTER, J. H., AKEROYD, J. H. and MOTULSKY, A. G. **The anaemia of copper deficiency in dogs compared with that produced by iron deficiency.** *Bull. Johns Hopkins Hosp.*, 1953, **93**, 41-49. [Lab. Metabol., Nat. Heart Inst., Nat. Insts. Health, Bethesda, Md.]

A marked difference was found between the anaemias due to Fe and Cu deficiency in dogs. Fe deficiency did not affect the number of red cells, but they were smaller and the concentration of Hb was much reduced; Cu deficiency seriously reduced the number of red cells without reducing Hb concentration. In the marrow there were indications that Cu is essential for maturation and production of normal numbers of red blood cells.

R. Hill.

852

BAXTER, J. H. and VAN WYK, J. J. **A bone disorder associated with copper deficiency. 1. Gross morphological, roentgenological, and chemical observations.**

BAXTER, J. H., VAN WYK, J. J. and FOLLIS, R. H. (Jr.) **2. Histological and chemical studies on the bones.** *Bull. Johns Hopkins Hosp.*, 1953, **93**, 1-23; 25-39. [Lab. Metabol., Nat. Heart Inst., Nat. Insts. Health, Bethesda, Md.]

1. Young dogs, about 4 weeks old, received a purified diet which contained less than 1 μ g. Cu per g. Control animals received the same diet with 8, 15, or 30 μ g. Cu added per g.

Cu-deficient animals became lame and their bones were deformed or fractured, after 2 to 5 months, but appetite and growth were normal. The clinical signs were always associated with unusually thin cortices, reduced cancellous bone and

wide epiphyseal cartilages, as well as anaemia. Affected animals had low Cu concentrations in blood and liver, but blood Ca, P, phosphatase, and vitamin D were normal. The bone abnormalities were not typical of rickets. Cu therapy improved cortex thickness and increased the amount of cancellous bone in a few weeks.

The skeleton was not affected by Fe deficiency even when the young dogs became severely anaemic.

2. Bones from the Cu-deficient dogs described above were sectioned for histological study and cleaned for chemical analysis.

Microscopic examination showed in more detail the effects which had been described from gross observations. There was severe resorption along the medullary surface of shafts, reduced amount of cancellous bone, and wider epiphyseal cartilages than normal, apparently not accompanied by gross disturbance of calcification. Chemical analysis of dry fat-free bone showed that the ash, Ca, P, and carbonate contents were all normal.

Possible reactions involved in the disturbed metabolism are discussed.—R. Hill.

See also Absts. 612-14, 1083, 1402.

OTHER MINERALS

853

STARKS, P. B., HALE, W. H., GARRIGUS, U. S. and FORBES, R. M. **The utilization of feed nitrogen by lambs as affected by elemental sulfur.** *J. Animal Sci.*, 1953, **12**, 480-491. [Dept. Animal Sci., Univ. Illinois, Urbana.]

Pair-feeding experiments lasting for 90 days were made with 4 Suffolk and 4 Shropshire wether lambs, of initial bodyweight from 37 to 52 lb. One member of each pair was given a modification of the ration used by Thomas *et al.* (Abst. 2858, Vol. 21), containing 2.46 per cent. N and 0.062 per cent. S. The other received the same basal ration, to each lb. of which was added 3 g. elemental S. The addition of S caused a significant increase in the retention of N ($P = 0.015$) and of S ($P < 0.01$), and an increase in wool growth ($P > 0.10$). The lambs receiving the additional S also came nearer to maintaining their original bodyweight.

The S-deficient lambs showed inappetence, loss of wool, excessive lachrymation, profuse salivation, weakness and cloudy eyes, and eventually died. There were some histological abnormalities of the liver, heart and spleen, but it is possible that these were due to some complication, not to primary S deficiency.—A. N. Worden.

854

HALE, W. H. and GARRIGUS, U. S. **Synthesis of cystine in wool from elemental sulfur and**

sulfate sulfur. *J. Animal Sci.*, 1953, **12**, 492-496. [Dept. Animal Sci., Univ. Illinois, Urbana.]

Two yearling wethers each weighing 120 lb. were provided with a diet of 4 lb. maize silage, 3 g. urea, 6 g. salt with trace minerals, 100 g. cerelose and 100 g. soya bean meal, with 7 g. Na_2SO_4 for one and 7 g. elemental S for the other. After preparatory periods of 69 and 111 days, respectively, the wethers were transferred to metabolism cages and $\text{Na}_2^{35}\text{SO}_4$ and ^{35}S were substituted for the stable isotopes. The radio-activity of the urine from the wether receiving sulphate was higher than that from the wether receiving elemental ^{35}S . Examination of wool samples from an area clipped before the experimental period showed that cystine had been synthesised from both forms and apparently to a greater extent from the sulphate.

A. N. Worden.

855

KAMEOKA, K. and MORIMOTO, H. [Utilisation of simple nitrogen compounds. 1. On the metabolism of nitrate in goats and rabbits.] *Bull. Nat. Inst. Agric. Sci., Chiba [G]*, 1953, No. 6, 147-150. In Japanese: English summary.

NaNO_3 as 2 per cent. of the diet was given to goats and rabbits. The nitrate was completely absorbed, but only about 50 per cent. was excreted in the urine. Part of it was reduced by micro-organisms and excreted as nitrite. (From summary.)—J. S. Thomson.

856

DE RENZO, E. C., KALEITA, E., HEYTLER, P. G., OLESON, J. J., HUTCHINGS, B. L. and WILLIAMS, J. H. Identification of the xanthine oxidase factor as molybdenum. *Arch. Biochem. Biophys.*, 1953, **45**, 247-253. [Lederle Labs. Div., American Cyanamid Co., Pearl River, N.Y.]

Weanling male rats received for one week a purified 21 per cent. casein diet described by Westerfeld and Richert (Absts. 4940, 4941, Vol. 21) and for a second week the same diet with different fractions of liver residue or the ash of soya bean meal added at the expense of glucose. The rats were then killed and homogenates of small intestine were prepared for estimation of xanthine oxidase activity.

The substance stimulating xanthine oxidase activity was present in the ash of both liver residue and soya bean meal, and similar stimulation was obtained from small amounts of Mo added to the diet as sodium or ammonium molybdate, molybdc or phosphomolybdc acid. The other elements present in liver residue ash were ineffective. The maximum daily requirement is estimated as about 0.2 to 0.3 μg . Mo per rat.—D. Duncan.

857

DE RENZO, E. C. Dietary requirement of molybdenum by the rat. *Naturwissenschaften*, 1953, **40**, 251. [Lederle Labs. Div., American Cyanamid Co., Pearl River, N.Y.]

A substance in liver residue which raises the level of tissue xanthine oxidase in the rat was identified as molybdenum. It is suggested that purified diets for the rat should include a supplement of Mo at the rate of 40 μg . per kg. diet. This amount produced a "saturation level" of xanthine oxidase in rat intestine.—R. Hill.

858

RICHERT, D. A. and WESTERFELD, W. W. Isolation and identification of the xanthine oxidase factor as molybdenum. *J. Biol. Chem.*, 1953, **203**, 915-923. [Dept. Biochem., Med. Coll., State Univ. New York, Syracuse.]

The unknown dietary substance previously reported (Absts. 545, Vol. 19; 1980, Vol. 20; 4940, 4941, Vol. 21) as necessary for the deposition and maintenance of normal levels of xanthine oxidase in the liver and intestines of rats has now been identified as molybdenum. Numerous fractions isolated from soya flour were tested and their biological activity was related to their Mo content. All the biological activity of the isolated fractions could be accounted for by their Mo content, since all fractions had the same activity as equivalent amounts of sodium molybdate; the Mo content and biological activity were not affected by ashing; removal of Mo by extraction as its ether-soluble thiocyanate or by precipitation with benzinoxime removed all biological activity.—W. Godden.

859

HOOD, S. L. and COMAR, C. L. Metabolism of cesium-137 in rats and farm animals. *Arch. Biochem. Biophys.*, 1953, **45**, 423-433. [Univ. Tennessee, Oak Ridge.]

860

LOONEY, W. B. and WOODRUFF, L. A. Investigation of radium deposition in human skeleton by gross and detailed autoradiography. *Arch. Pathol.*, 1953, **56**, 1-12. [Div. Biol. Med. Res., Argonne Nat. Lab., Lemont, Ill.]

861

WEITZEL, G. and FRETZDORFF, A. M. (with EBERHAGEN, A.) Zink in den Augen von Säugetieren. [Zinc in the eyes of mammals.] *Hoppe-Seyler's Ztschr.*, 1953, **292**, 221-231. [Med. Forschungsanst., Max Planck Gesellsch., Göttingen.]

See also Abst. 481.

ACID BASE EQUILIBRIUM

862

KAISER, I. H. **The hydrogen ion concentration of human fetal blood in utero at term.** *Science*, 1953, **118**, 29-30. [Dept. Obstet., Med. Sch., Univ. Minnesota, Minneapolis.]

The mean pH of venous and arterial umbilical blood of 12 fetuses at term was 7.32 and 7.26, respectively, indicating a state of acidosis. The

samples were taken at caesarean section.

F. C. Aitken.

863

RICHARDSON, J. E., BILLINGHURST, J. R. and VERE, D. W. **Acid-base disturbance and potassium depletion in some surgical patients.** *Lancet*, 1953, **265**, 587-590. [Surg. Unit, London Hosp.]

METABOLISM OF WATER

864

MERIVALE, W. H. H. **Control of salt and water balance.** *Practitioner*, 1953, **171**, 267-275. [Dept. Clin. Pathol., Guy's Hosp. Med. Sch., London.]

865

LAMBIOTTE-ESCOFFIER, C., MOORE, D. B. and TAYLOR, H. C. (Jr.) **The volume of distribution of inulin, antipyrine, and radiosodium during normal and toxemic pregnancy and during the puerperium.** *Amer. J. Obstet. Gynecol.*, 1953, **66**, 18-26. [Dept. Obstet. Gynaecol., Coll. Phys. Surg., Columbia Univ., New York.]

Simultaneous T 1824, inulin, ^{24}Na and antipyrine space estimations were made on 4 patients with severe and 3 with mild pre-eclampsia, 2 with pathological pregnancy (one with oedema, hydramnios and triplets, and one with severe anaemia), 2 in normal pregnancy and 2 normal non-pregnant women. Repeat estimations were made in the pre-eclamptic patients 9 to 63 days after delivery, when all signs had disappeared. Pre-eclamptic patients were maintained on a low-salt diet. All subjects were studied in approximately basal conditions after an overnight fast. A preliminary trial showed that antipyrine passed the placental barrier freely; the work of others indicates that inulin does not penetrate the amniotic sac and that penetration of Na is variable.

In pre-eclampsia the antipyrine and Na spaces were consistently expanded, but the inulin space was normal and plasma volume changes were "unimpressive". Similar changes were found in the 2 women with pathological pregnancy. The puerperal estimates in pre-eclampsia showed considerable reduction of antipyrine and Na spaces, but much less change in the inulin space. The reduction of antipyrine space correlated well with loss of bodyweight. In normal pregnancy there was a slight increase of inulin space but no striking change in antipyrine or Na space. It is concluded

that excessive storage of water and Na in pre-eclampsia is not confined to the extracellular fluid space.—A. M. Thomson.

866

GAMBLE, J. L. (Jr.), ROBERTSON, J. S., HANNIGAN, C. A., FOSTER, C. G. and FARR, L. E. **Chloride, bromide, sodium, and sucrose spaces in man.** *J. Clin. Invest.*, 1953, **32**, 483-489. [Med. Dept., Brookhaven Nat. Lab., Upton, Long Island, N.Y.]

867

WALKER, J. M. **Physiological effects of smoking.** *Proc. Nutrit. Soc.*, 1953, **12**, 157-160. [Dept. Pharmacol., Univ. Oxford.]

868

HIX, E. L., EVANS, L. E. and UNDERBJERG, G. K. L. **Extracellular water and dehydration in sheep.** *J. Animal Sci.*, 1953, **12**, 459-473. [Dept. Animal Husb., Kansas Agric. Exp. Stat., Manhattan.]

Extracellular water and total body water were estimated simultaneously in crossbred lambs by methods employing NaSCN or antipyrine, which are being published in detail elsewhere. The extracellular fluid volume in normal sheep was found to be equal to 30 per cent. of the sheared bodyweight and to be extremely consistent in any individual.

The basal ration employed for the first series of experiments consisted of maize and alfalfa hay, in which the ratio Na to K was 1 to 45. The addition of sufficient KHCO_3 to make this ratio 1 to 82 had a dehydrating effect, there being a resulting Na diuresis. The alternative provision of either NaCl or NaHCO_3 had a hydrating effect, and in a further series of experiments it was shown that the administration of NaCl to lambs on a low Na intake caused a rapid expansion of extracellular fluid volume. The sheep appears to have a particular ability to conserve body Na.

Equations are given for calculating total body Na, total exchangeable Na and extracellular Na from estimated serum Na and extracellular fluid volume.—A. N. Worden.

869

KANTER, G. S. **Heat and hydropenia; their effects on thirst and chloride regulation in dogs.** *Amer. J. Physiol.*, 1953, **174**, 95–105. [Dept. Physiol., Sch. Med., Univ. Rochester, N.Y.]

870

BARTHOLOMEW, G. A. (Jr.) and DAWSON, W. R. **Respiratory water loss in some birds of south-**

western United States. *Physiol. Zool.*, 1953, **26**, 162–166. [Dept. Zool., Univ. California, Los Angeles.]

Measurement of loss of water was made within 24 hr. of capture in wire mesh traps baited with grain on 56 birds belonging to 13 sub-species of 12 species found in desert regions. There was an inverse relation between bodyweight and rate of water loss, and the water formed in normal resting metabolism was less than the water lost in respiration. The respiratory loss of water was considered to be critical in restricting the distribution of desert birds to areas in which sufficient water is available.—A. M. Copping.

See also Abst. 602.

METABOLISM OF OTHER SUBSTANCES

871

CUTHBERTSON, W. F. J. **Haematological and nutrition effects of oral antibiotics.** *Gastroenterologia*, 1953, **79**, 327–328. *Proc.* [Glaxo Labs., Greenford, Middlesex.]

872

SCHIPPER, I. A. and PETERSEN, W. E. **Milk, blood, and urine concentrations of terramycin following intravenous, intramammary, and intramuscular administration.** *Vet. Med.*, 1953, **48**, 315–318. [Dept. Dairy Husb., Univ. Minnesota, St. Paul.]

873

HAVERMANN, H. and SCHARPENSEEL, H. W. **Antibiotika im Stoffwechsel des Legehuhns. Bilanz und Verteilungsstudien mit ³⁵S-N-Äthyl-Piperidin-Penicillin. [Antibiotics in the metabolism of the laying hen. Balance and distribution studies with ³⁵S-N-ethyl-piperidine-penicillin.]** *Arch. Geflügelk.*, 1953, **17**, 193–200. [Inst. Tierzucht, Univ. Bonn.] English summary.

After a preliminary period of 14 days on a diet containing 2 mg. of ordinary penicillin daily, 2 laying hens were given by mouth 8 mg. ³⁵S-N-ethyl-piperidine penicillin, and the recovery of ³⁵S in excreta was estimated. During 30 hr. this amounted to 96 per cent. of the total, mostly in organic combination, probably as penicillin or its decomposition products. After slaughter the distribution in the body tissues and organs of the small amount of ³⁵S incorporated was examined. Most of it was found in the bones, and little was present in the eggs.—W. Godden.

874

CASTILLON, L. E., KARON, M., ALTSCHUL, A. M. and MARTIN, F. N. **Preparation of combina-**

tion products of gossypol with glycine and dextrose and their toxicity toward mice. *Arch. Biochem. Biophys.*, 1953, **44**, 181–188. [S. Reg. Res. Lab., New Orleans, La.]

A freshly-prepared combination product of gossypol and glucose, when given to mice by stomach tube, proved more toxic than gossypol itself and as toxic as the isolated pigment glands of cottonseed. The toxicity decreased appreciably on storage. A combination product of gossypol and glycine was not toxic to mice in doses of as much as 12.0 g. per kg. bodyweight, but a physical mixture of gossypol and glycine was as toxic as gossypol. Purified gossypol-glycine, which contains 3.37 per cent. N, does not correspond to any molecular compound of gossypol and glycine, but apparently the substances enter into some chemical combination which alters the pharmacological properties of gossypol. Gossypol-glycine is soluble in water and differs from gossypol in many of its properties.—M. B. Richards.

875

SERLING, F., MAXWELL, E. S. and OETTINGEN, W. F. v. **Comparative excretion and distribution of C¹⁴-labeled carbonate and formate in large albino rats.** *Amer. J. Physiol.*, 1953, **174**, 33–38. [Nat. Inst. Arthritis and Metabol. Dis., Nat. Insts. Health, Bethesda, Md.]

Eleven adult male rats weighing from 400 to 537 g. received a diet of 10 per cent. dextrose in whole milk. After 10 to 14 days, 6 rats received single intraperitoneal injections of 0.03 to 0.05 mC. ¹⁴C-labelled sodium carbonate and 4 a similar volume of solution containing 0.07 to 0.10 mC. sodium formate. The rats were then placed in closed respirometers for 8 days, receiving the same diet. At the end of the experiment the rats were anaesthetised and tissue samples were removed for analysis.

Recovery of ^{14}C from excreta and tissues was 96 to 101 per cent. in the carbonate group and 92 to 110 per cent. in the formate group. Patterns of excretion and distribution were similar, but carbonate excretion was more rapid and more complete. More than 90 per cent. of the ^{14}C from carbonate was excreted in the first 24 hr., and 80 per cent. of that from formate. At the end of the experiment the percentages excreted were 95 and 90, respectively, and most of this was in CO_2 . Tissue distribution of the remainder was similar in both groups, and is fully described.

D. Duncan.

876

ZIRM, K. L. and KILCHES, R. Zur Frage der Resorbierbarkeit von wasserlöslichem Blattgrün unter Anwendung eines C^{14} -markierten Chlorophyllins. [The question of absorption of soluble chlorophyll studied with chlorophyllin labelled with ^{14}C .] *Biochem. Ztschr.*, 1953,

324, 241-243. [Forsch. Lab., Lannacher Heilmittel G.m.b.H., Lannach, Styria.]

Groups of white mice which were given by stomach tube a solution of chlorophyllin-Na, labelled with ^{14}C , were killed after intervals of 1½, 16 and 24 hr. Only the small and large intestines at any time showed radio-activity. Another group were kept in a suitable cage and faeces were collected every 24 hr. The radio-activity of the faeces, after showing a maximum value in the first 24 hr., rapidly diminished, but had not completely disappeared after 8 days. This protracted excretion is explained by the mixing of older and fresher intestinal contents in the caecum. The results show clearly that soluble chlorophyll, given to mice by mouth, is not absorbed through the wall of the intestine. The mechanism of the action of chlorophyll is therefore to be sought in the intestine itself.—M. B. Richards.

See also Abst. 611.

METABOLISM OF CELLS, TISSUES, ETC.

GENERAL PHYSIOLOGY

877

CARRUTHERS, C. and SUNTZEFF, V. Biochemistry and physiology of epidermis. *Physiol. Rev.*, 1953, **33**, 229-243. [Wernse Lab. Cancer Res., Med. Sch., Washington Univ., St. Louis, Mo.]

878

BERNSTEIN, R. E. Some factors affecting glucose utilisation and potassium and sodium exchanges in human red cells. *S. African J. Med. Sci.*, 1953, **18**, 31. *Proc.* [Dept. Physiol., Med. Sch., Univ. Witwatersrand, Johannesburg.]

879

DAVENPORT, H. W. and CHAVRÉ, V. J. Acid secretion and oxygen consumption by mouse stomachs *in vitro*. *Amer. J. Physiol.*, 1953, **174**, 203-208. [Dept. Physiol., Coll. Med., Univ. Utah, Salt Lake City.]

880

REID, L. C. Effect of thiourea and thyroxine on oxygen uptake of tissue homogenates. *Arch. exp. Pathol. Pharmacol.*, 1953, **219**, 466-468. [Dept. Surg., Univ. New York.]

The effect of thiourea on oxygen uptake in tissue homogenates from mice and rats was studied by the Warburg technique. In liver, kidney, spleen, brain, gastric mucosa and skeletal muscle, with K succinate as substrate, thiourea decreased O_2 uptake. In 18 experiments with heart tissue, however, there was a small but definite increase in O_2 uptake. When succinate

was replaced by α -ketoglutarate, citrate or malate, for kidney, liver or brain tissue, thiourea again reduced O_2 uptake.

Thyroxine in concentration of at least 3 μg . per ml. increased O_2 uptake by homogenates of liver, kidney or brain and counteracted the depression produced by thiourea.

The possibility is considered that thiourea is not a specific antithyroid drug, but a general depressant.

D. Duncan.

881

RENOLD, A. E., NESBETT, F. B. and HASTINGS, A. B. Utilization of labelled glucose and fructose by liver slices of normal and diabetic rats. *J. Clin. Endocrinol.*, 1953, **13**, 862. *Proc.* [Dept. Biol. Chem., Harvard Med. Sch., Boston, Mass.]

882

SADHU, D. P. Physiological significance of lactose in pigeons. *Amer. J. Physiol.*, 1953, **174**, 238-240. [Dept. Physiol., Presidency Coll., Calcutta.]

Of 3 groups of 8 young pigeons receiving whole wheat to appetite, one group received in addition daily for 4 weeks 1 g. glucose, and one group 1 g. lactose. Extracts of brain and liver were then analysed for cerebroside, sphingomyelin, phospholipin and fat, and homogenates of liver and small intestine were used to study lactic dehydrogenase activity.

In the lactose-fed group bodyweight decreased and liver fat and phospholipin were low. Brain phospholipin and cerebroside were slightly above

control levels, but sphingomyelin was much less. With glucose, however, brain cerebroside was significantly reduced and liver sphingomyelin was lower than in the lactose or control group.

Dehydrogenase activity was relatively low in the liver of lactose-fed pigeons, and high in the intestine.—D. Duncan.

883

KERNER, E. and WESTERFELD, W. W. **Effect of diet on rate of alcohol oxidation by the liver.** *Proc. Soc. Exp. Biol. Med.*, 1953, **83**, 530-532. [Dept. Biochem., State Univ. New York.]

Oxidation of alcohol by liver homogenates was estimated manometrically by O_2 consumption by a procedure designed to indicate alcohol dehydrogenase in the liver.

Young and adult male rats were given chow, 24 per cent. casein, or protein-free diets for 16 or 24 days, and energy restriction was studied by starvation for 7 days or 50 per cent. restriction of chow intake for 14 days.

Alcohol oxidation by liver homogenates was half as great in weanling rats as in adults, but it reached the adult level after 16 days on chow or the high-protein diet. In both adults and young rats the protein-free diet reduced alcohol oxidation to low levels. Starvation of adult rats reduced alcoholic oxidation by about 50 per cent., but partial restriction of chow intake gave only a slight reduction after 2 weeks.—D. Duncan.

884

FISCHER, A. **On the protein metabolism of tissue cells *in vitro*.** *J. Nat. Cancer Inst.*, 1953, **13**, 1399-1424. [Biol. Inst., Carlsberg Found., Copenhagen.]

885

MATTHEWS, D. M. and WISEMAN, G. **Transamination by the small intestine of the rat.** *J. Physiol.*, 1953, **120**, 55P. [Dept. Physiol., Univ. Sheffield.]

886

HOCH-LIGETI, C. **Influence of low protein diet on distribution of D-amino acid oxidases in rats.** *Proc. Soc. Exp. Biol. Med.*, 1953, **83**, 403-405. [Dept. Pathol., Med. Sch., Univ. Virginia, Charlottesville.]

Three diets, one containing 8.5 per cent. casein, carbohydrates, fats, salts and vitamins, one similar with the addition of 5 μ g. α -oestradiol daily, and a control diet of rat biscuits, were given to groups of rats for 3 or 9 months. The animals were then killed and the oxygen uptake of homogenates of liver or kidney in the presence of DL-alanine or D-aspartic acid was estimated; behaviour towards these 2 substrates was found to be similar.

All the rats on the low-protein diets had enlarged fatty livers; the livers of the male rats receiving oestradiol showed pronounced cirrhosis and some cholangiomas. The D-amino-acid oxidase activity of the kidney was similar for each diet, but the activity of the liver of rats given the low-protein diets was about half that of the controls; oestradiol had no added effect.—C. Warner.

887

SHEFFNER, A. L. and BERGEIM, O. **The effect of dietary amino acid levels upon the oxidation of L- and D-amino acids by kidney tissue.** *J. Nutrition*, 1953, **50**, 141-148. [Dept. Biol. Chem., Univ. Illinois Coll. Med., Chicago.]

Rats received basal diets with either 10 or 15 per cent. casein and groups of 4 to 6 animals received supplements of DL-methionine or DL-phenylalanine. Each supplement increased the oxidation of L-methionine by kidney slices. D-Amino-acid oxidase activity was greater after the 15 per cent. than the 10 per cent. casein diet; supplementation of the latter, but not of the former, with DL-methionine increased the resulting activity. Succinic dehydrogenase activity of kidney slices was not affected by addition of amino-acids to the 15 per cent. casein diet.—D. Duncan.

888

KNOTH, W. **Beitrag zum Problem des Fett- und Lipidstoffwechsels in Gewebekulturen. [Problem of fat and lipid metabolism in tissue cultures.]** *Arch. exp. Pathol. Pharmacol.*, 1953, **218**, 199-214. [Pathol. Inst., Akad. Med. Forsch., Justus Liebig Hochsch., Giessen.]

889

POPJÁK, G. and TIETZ, A. **The biosynthesis of fat and cholesterol *in vitro* by ovarian tissues of the laying hen.** *Biochem. J.*, 1953, **54**, xxxv. [Nat. Inst. Med. Res., Mill Hill, London, N.W.7.]

890

SAKA, M. O. and SIPAHIOĞLU, Ü. **Lipolytic activity of liver tissue of rats on a diet deficient in essential fatty acids.** *Amer. J. Physiol.*, 1953, **174**, 49-50. [Dept. Physio-Pathol., Univ. Istanbul, Turkey.]

Rats were fed on fat-deficient diets until arrest of growth, emaciation and scaliness of the feet, tail and skin appeared, usually in about 8 weeks. Other groups of animals were fed for 4 weeks on the same diet, which was then supplemented with arachidonic acid or a mixture of linoleic and linolenic acids. The lipolytic activity of liver homogenates was then estimated by the method of Willstaetter and Memmen (*Hoppe-Seyler's Ztschr.*, 1923, **121**, 1), with tributyrin as substrate.

The lipolytic activity in livers of animals deprived of essential fatty acids was considerably diminished. Arachidonic acid was more effective in re-establishing liver lipase activity than was the mixture of linoleic and linolenic acids.

G. A. Garton.

891

HUMOLLER, F. L. and ZIMMERMAN, H. J. **Relation of choline oxidase activity to dietary fatty livers.** *Amer. J. Physiol.*, 1953, **174**, 199-202. [Med. Res. Lab., Vet. Hosp., Omaha, Nebr.]

Fatty livers were produced in rats by a high-fat, low-choline diet containing, per cent., casein 5, glucose 48, cellulose 2, lard 40 and salt mixture 5, with a vitamin mixture. The rats were killed and choline oxidase activity of liver homogenates was estimated manometrically.

There was a precipitous decline in choline oxidase activity from the first day on which the diet was consumed, but after about a week the decrease became slower. During the first week the increase in liver fat was as rapid as the decrease in choline oxidase, but the increase was maintained and the inverse relationship ceased after this time. When 1.16 mg. or more stearic acid was added to the liver homogenates there was a decrease of choline oxidase activity, especially at pH 6-7. This effect occurred with both normal and fatty livers.

When 10 mg. choline or betaine was injected 2 hr. before death, after 14 days on the high-fat diet, there was no effect on liver choline oxidase activity, or on the endogenous O_2 uptake of the homogenates.—D. Duncan.

892

POPJÁK, G. and TIETZ, A. **Fatty-acid synthesis in slices and homogenates of rat mammary gland.** *Biochem. J.*, 1953, **54**, xxxv. [Nat. Inst. Med. Res., Mill Hill, London, N.W.7.]

893

POPJÁK, G. and TIETZ, A. **Biosynthesis of fatty acids from [carboxy- ^{14}C] acetate by soluble enzyme system prepared from rat mammary gland homogenates.** *Biochim. biophys. Acta*, 1953, **11**, 587-589. [Nat. Inst. Med. Res., Mill Hill, London, N.W.7.]

The mammary glands of lactating rabbits were homogenised in a buffer solution at pH 7.4. The homogenate was filtered and fractions designated as supernatant, mitochondria and microsomes were separated by centrifuging. The fractions were incubated separately or in combination with ^{14}C -carboxyl-labelled acetate, K oxaloacetate and adenosinetriphosphate.

The supernatant incorporated 5 to 10 times as much acetate into fatty acids as the full homogenate or the mitochondria. When the super-

natant was combined with mitochondria, fatty acid formation was reduced to the lower levels observed with the full homogenate; no fatty acid synthesis was found to occur with microsomes alone.—G. A. Garton.

894

CRABBE, E. M. **Carbohydrate metabolism of mammary gland homogenates.** *J. Dairy Sci.*, 1953, **36**, 589-590. *Proc.* [Univ. Illinois, Urbana.]

895

DUNCOMBE, W. G. and GLASCOCK, R. F. **Observations on the oxidation of glucose and acetate by lactating sheep mammary tissue *in vitro*.** *Biochem. J.*, 1953, **55**, xxiii-xxiv. [Nat. Inst. Res. Dairying, Univ. Reading.]

896

PENNINGTON, R. J. and SUTHERLAND, T. M. **Metabolism of pyruvate, lactate and glucose by sheep-rumen epithelium.** *Biochem. J.*, 1953, **54**, xxxvii. [Rowett Res. Inst., Bucksburn, Aberdeenshire.]

897

GEYER, R. P., BOWIE, E. J. and BATES, J. C. **Effect of pyruvate on octanoate metabolism as influenced by potassium and lithium.** *J. Biol. Chem.*, 1953, **203**, 625-628. [Dept. Nutrit., Harvard Sch. Pub. Health, Boston, Mass.]

In continuation of earlier work (Absts. 5220, Vol. 19; 3307, Vol. 23) liver, kidney, spleen and heart slices from rats which had been maintained on a stock diet were incubated for 1 hr. with ^{14}C -labelled sodium octanoate in 0.154 M NaCl containing Na_2HPO_4 -HCl buffer; pyruvate was added and sometimes K or Li salts at 77 m. equiv. per litre. Pyruvate decreased octanoate metabolism by liver slices when high concentrations of K or Li were present, the effect being mainly on acetoacetate formation. Acetate or lactate in place of pyruvate, without K or Li, was without effect, but glycerol caused a decrease of acetoacetate formation and an increase in $^{14}CO_2$. Pyruvate decreased octanoate metabolism by kidney slices, and acetate decreased $^{14}CO_2$ formation when the concentration of K in the medium was high. Pyruvate decreased octanoate metabolism by heart but not by spleen.—W. Godden.

898

WIKRAMANAYAKE, T. W., HEAGY, F. C. and MUNRO, H. N. **The effect of level of energy intake on the metabolism of ribonucleic acid and phospholipin in different parts of the liver cell.** *Biochem. biophys. Acta*, 1953, **11**, 566-574. [Dept. Biochem., Univ. Glasgow.] French and German summary.

Adult rats received a protein-free diet at different levels of energy intake for 4 or 11 days before being killed. Some received ^{32}P as inorganic phosphate by intramuscular injection 2, 4 or 18 hr. before death. The livers were perfused with saline and removed, to be separated into cell fractions.

The specific activity of ribonucleic acid (RNA) P in the whole cell increased with increased energy intake. The increase occurred first in the nuclear RNA, but by 4 hr. after ^{32}P injection it was shown in all cell fractions, least in the cell sap. The phospholipin P showed no change in ^{32}P uptake comparable to those in RNA.

Total RNA, protein and phospholipin in the mitochondrial fraction showed little variation with diet, but RNA in the microsomes was considerably reduced by protein-free diet. RNA was increased in microsomes and cell sap by raising the energy intake, whether the diet contained protein or not. Total protein was increased in the microsomes by increasing energy intake at both levels of protein intake, but in cell sap total protein increased only when the diet contained protein. Phospholipin in microsomes and cell sap also showed some influence of diet and the energy intake had more effect when the diet contained protein.

The reasons for the differences in RNA metabolism are discussed.—D. Duncan.

899

DiSTEFANO, V. and NEUMAN, W. F. **Calcium complexes of adenosinetriphosphate and adenosinediphosphate and their significance in calcification *in vitro*.** *J. Biol. Chem.*, 1953, **200**, 759-763. [Div. Pharmacol., Dept. Radiation Biol., Sch. Med. Dent., Univ. Rochester, New York.]

^{45}Ca was shaken for 3 hr. at 37°C . with solutions of adenosinetriphosphate (ATP) or adenosinediphosphate (ADP) in veronal buffer at pH 7.4, with Dowex 50 cation exchange resin in the Na form. Relatively undissociated Ca complexes were formed, ATP being the stronger complex-forming agent; the dissociation constants for the ATP and ADP complexes were 8.7×10^{-5} and 1.8×10^{-4} , respectively.

Tibial sections from rachitic albino rats were incubated with 0.005 M ATP; hydrolysis of ATP was slow and the total inorganic P liberated at the end of 7 hr. was only 5.6 per cent.

The results are considered to explain the inhibitory effect of ATP on calcification of rachitic bone slices *in vitro*.—A. Iggo.

900

ROSENBERG, S. and KIRK, P. L. **Isolation of a dialyzable growth factor for chick tissue**

culture. Identification of the ninhydrin reactive band. *Arch. Biochem. Biophys.*, 1953, **44**, 226-229. [Dept. Biochem., Univ. California, Berkeley 4.]

See also Abst. 526.

GROWTH AND METABOLISM OF TUMOUR CELLS

901

KYANK, H. and SCHLEGEL, L. **Bestimmung der Eiweissreserve bei Kollum-Karzinom-Kranken. [Estimation of the protein reserve in patients with carcinoma of the cervix.]** *Arch. Geschwulstforsch.*, 1953, **5**, 216-220. [Univ. Frauenklin., Leipzig.]

Labile protein reserve was measured by estimating plasma volume by the Congo Red method, serum protein by micro-Kjeldahl and the albumin:globulin ratio by Howe's method before and after injection of 1 litre physiological saline. The labile reserve decreased with assessed duration of the disease and disappeared with the commencement of wasting.—I. Leitch.

902

STEWART, A. G. and BEGG, R. W. **Systemic effects of tumors in force-fed rats. 2. Effect on the weight of carcass, adrenals, thymus, liver and spleen. 3. Effect on the composition of the carcass and liver and on the plasma lipids.** *Cancer Res.*, 1953, **13**, 556-559; 560-565. [Dept. Med. Res., Univ. W. Ontario, London.]

2. Groups of male Sprague Dawley rats of initial weight between 163 and 200 g. had Walker 256 carcinoma implanted in both lumbar regions, and were force-fed with diets high in fat, equivalent to 83 or 60 per cent. of the energy, or in protein or carbohydrate, each as 60 per cent. of the energy. The diet was mixed with water and 20 ml., equivalent to 35 Cal., were given twice daily. Rats without tumour, of similar initial weight, were force-fed on these diets as controls. Two further groups with implants of Walker 256 carcinoma and 2 groups without tumour, fed to appetite on a stock chow diet or on the synthetic diet containing fat as 60 per cent. of the energy, were also studied.

The final bodyweights of the force-fed control rats and the control rats fed on chow to appetite were similar, but significantly less than those of the rats fed to appetite on the high-fat diet. Despite the fact that they ingested the same amount of food, the final bodyweights of the force-fed tumour-bearing rats were significantly greater than those of their controls, but after allowing for the weight of their tumours, about 20 per cent. of their bodyweights, their carcass weights were considerably less with diets containing 83 per cent. fat or

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60 per cent. carbohydrate. The final carcass weight of the tumour-bearing rats fed to appetite was less than that of normal rats. Tumour-bearing rats had larger adrenals, livers and spleens and smaller thymuses. Force-feeding did not prevent these changes.

3. As compared with the non-cancerous rat receiving the same amount of food, carcass analysis suggested that the increased bodyweight of the tumour-bearing force-fed rat was due to water. High blood lipids, from 1122 to 5598 mg. per 100 ml. plasma, were found in the tumour-bearing rats; the control values were 214 to 289 mg. per 100 ml. Increased plasma phospholipin and cholesterol accounted for only a small amount of this increase. Tumour-bearing rats had less N and fatty acids in their carcasses, and the loss was diminished, but not prevented, by forced feeding.—J. M. Naftalin.

903

TANNENBAUM, A. and SILVERSTONE, H. **Effect of limited food intake on survival of mice bearing spontaneous mammary carcinoma and on the incidence of lung metastases.** *Cancer Res.*, 1953, **13**, 532–536. [Dept. Cancer Res., Med. Res. Inst., Michael Reese Hosp., Chicago, Ill.]

In 2 experiments C3H female mice fed to appetite on Purina chow were examined at fortnightly intervals for the appearance of spontaneous mammary tumours. The mice developing tumours were then paired according to weight, size and location of tumour. One mouse of each pair was fed on Purina fox chow meal 50, skimmed milk powder 25, maize starch 20, brewer's yeast 3 and partly hydrogenated cottonseed oil 2 per cent., and given 3.6 g., equivalent to 13 Cal., daily (full-fed). The other mouse was given 2.0 g., equivalent to 7.4 Cal., daily (underfed). In a third experiment, planned to examine the incidence of metastases, one mouse of each pair was given Purina meal 1.2 g., milk powder 0.7 g., brewer's yeast 0.1 g. and maize starch 1.6 g. (total 3.6 g.); the other was given 2.1 g. by reducing the starch to 0.1 g. (energy-restricted).

In experiment 1 the full-fed mice survived 83 ± 48 days after the detection of their tumour, and the underfed mice lived 23.8 ± 7.93 days longer. In experiment 2 the figures were 74 ± 4.5 and 16.2 ± 6.61 . Sixty-five per cent. in experiment 1 and 69 per cent. in experiment 2 of the underfed mice outlived their controls. Fewer of the underfed and energy-restricted mice developed additional mammary carcinomas or grossly visible lung metastases. This was most apparent in experiment 3, in which the survivor was killed on the death of its control.

The underfed and energy-restricted mice lost more weight than the full-fed controls.

J. M. Naftalin.

904

TANNENBAUM, A. and SILVERSTONE, H. **The genesis and growth of tumours. 6. Effects of varying the level of minerals in the diet.** *Cancer Res.*, 1953, **13**, 460–463. [Dept. Cancer Res., Med. Res. Inst., Michael Reese Hosp., Chicago 16, Ill.]

For earlier studies in the series see Absts. 630, Vol. 10, 937, Vol. 19 and 1549, Vol. 23.

With a purified diet the mineral intake of mice was varied by additions of Wesson's modification (*Science*, 1932, **75**, 339) of the Osborne-Mendel salt mixture at 2, 4 and 8 per cent. The mineral content of the diet had no significant effect on the incidence of spontaneous mammary cancer or of skin tumours induced by carcinogenic hydrocarbons, their time of appearance or their rate of growth.—D. Harvey.

905

POPPER, H., DE LA HUERGA, J. and YESINICK, C. **Hepatic tumors due to prolonged ethionine feeding.** *Science*, 1953, **118**, 80–82. [Hektoen Inst. Med. Res., Chicago, Ill.]

Female rats were given 0.5 or 0.2 per cent. ethionine in a diet of casein 16, sucrose 75 and maize oil 5 per cent. with essential minerals and vitamins. The methionine content was 0.4 per cent. Nodules of liver cells (hepatomas) or in bile ducts (cholangiofibrosis or cholangiomas) were seen in 8 of 12 rats given 0.5 cent. ethionine for 51 days, in 1 rat given 0.5 per cent. for 77 days and in 2 of 4 given 0.2 per cent. from 87 to 104 days. Of 6 rats for which the 0.5 per cent. ethionine diet alternated with stock diet, 2 showed nodules after 60 and 67 days. Such lesions were not found in rats given 0.2 per cent. ethionine for shorter periods or in controls given the purified diet without ethionine.

The liver histology is described and illustrated with photomicrographs.—F. C. Aitken.

906

LEVY, H. M., MONTAÑEZ, G., MURPHY, E. A. and DUNN, M. S. **Effect of ethionine on tumor growth and liver amino acids in rats.** *Cancer Res.*, 1953, **13**, 507–512. [Chem. Lab., Univ. California, Los Angeles.]

Rats received subcutaneous inoculations of fibrosarcoma or Jensen sarcoma tissue. DL-Ethionine was incorporated into the diet at the 0.25, 0.5 or 1.0 per cent. level, or was injected subcutaneously.

In control rats with food intake restricted to that of tumour-bearing animals ethionine produced early loss of weight, but this did not continue except at very high levels of injected ethionine. In tumour-bearing rats ethionine retarded the growth of the tumours and increased the percentage

which regressed. Necrosis occurred in all the tumours.

There was no significant difference in the percentage of total amino-acids in the liver between normal, tumour-bearing and ethionine-treated rats, but the percentage of free amino-acids increased

in livers of rats bearing large tumours and in all those receiving ethionine in the diet.

There were numerous deaths from ethionine poisoning and probably also from the toxicity of the products of necrosis.—D. Duncan.

See also Absts. 453, 886.

METABOLISM OF GROWTH, REPRODUCTION AND SENESCENCE

GROWTH

907

ALM, I. **The long-term prognosis for prematurely born children: a follow-up study of 999 premature boys born in wedlock and of 1002 controls.** *Acta paediat.*, 1953, **42**, Suppl. 94, pp. 116. [Clin. Paediat., Karolinska Sjukhus, Stockholm.] French, German and Spanish summaries.

The persons studied were born in 3 hospitals in Stockholm between 1902 and 1921. The premature boys weighed from 1010 to 2500 g. at birth. The controls were of birthweight over 2760 g. and of comparable social background. Mortality remained considerably higher among the prematures until the children were 2 years old, and it was greater among plural-born than among single-born premature boys. At 20 years of age the mean height and weight of the premature group were significantly less than those of the controls; mean weight 64 compared with 67 kg. The proportion receiving pensions or institutional care because of mental deficiency, spastic paralysis or other conditions possibly related to birth injury was significantly greater in the premature group. The premature, however, were a match for the control group in respect of social adaptation and economic status. A critical review of previous work on this subject is included.—M. S. Fraser.

908

MILLIS, J. **Factors influencing the birth weight of offspring.** *Med. J. Malaya*, 1953, **7**, 168–178. [Dept. Social Med., Univ. Malaya, Singapore.]

In continuation of previous work (Abst. 2775, Vol. 22), data are discussed for 9473 boys and 8976 girls, normal full-term infants born in 1950 and 1951 to Chinese mothers in hospital in Singapore. It is considered probable that the poorer people's diet was adequate in quantity, but low in protein, Ca and some vitamins.

Mean birthweights in 1950 and 1951 were 6.89 and 6.91 lb. for boys and 6.72 and 6.71 lb. for girls; the sex difference was significant. Mean birthweights for 719 boys and 770 girls born to Indian mothers were about 0.4 lb. less. For the Chinese babies mean birthweight increased with parity, the difference for males being significant even beyond the third birth, and with age of mother

when these were considered separately; their interaction is discussed elsewhere (Millis and You, 1953, in the press). There was no seasonal effect, but the climate of Singapore is much the same all the year round.—W. M. Deans.

909

MILLIS, J. **Growth curves of Singapore-born Chinese infants during the first year.** *Med. J. Malaya*, 1953, **7**, 296–304. [Dept. Social Med., Univ. Malaya, Singapore.]

Mean weights in oz. of healthy Chinese infants, 711 male and 665 female, of mothers, mainly from the poorer classes, attending government welfare clinics in Singapore in the years 1949 to 1951, are tabulated and shown graphically for the sexes separately. Weight increase was equal to that of British and American infants during the first 6 months, but less during the second 6 months, so that the difference at 1 year was about 4 lb. The results resembled those of Guy *et al.* (Title 5267, Vol. 7) for Chinese infants in Peiping.

W. M. Deans.

910

SALBER, E. J. and BRADSHAW, E. **Weight of Bantu babies in the first 10 days of life.** *Brit. J. Prev. Social Med.*, 1953, **7**, 154–159. [Inst. Family and Community Health, Durban.]

This study covered 598 full-term healthy Bantu babies born in hospital and breast-fed at approximately 3-hr. intervals with a night feed. For both boys and girls the maximum mean loss of weight was on the 3rd day and amounted to about 5 per cent. of birthweight. Firstborn babies lost more of their birthweight and took longer to regain it than later babies. By the 7th day 48 per cent. of the babies had regained their birthweight and by the 9th day, 59 per cent. This good progress is ascribed to the excellence of Bantu mothers as breast-feeders.—W. M. Deans.

911

PHILLIPS, H. T. **Some social and ethnic variations in the physique of South African nursery school children.** *Arch. Dis. Childhood*, 1953, **28**, 226–231. [Inst. Family and Community Health, Durban.]

For this study heights and weights of 392 boys and 409 girls, measured at quarterly intervals between the ages of $2\frac{3}{4}$ and $5\frac{1}{2}$ years, and some from $2\frac{1}{4}$ to $6\frac{1}{4}$ years, were extracted from the records of nursery schools in Cape Town (1 white upper-income), Johannesburg (3 white upper-income, 5 white lower-income) and Durban (1 white upper-income, 1 Bantu, above-average urban) for periods ranging from 1936 to 1951. Quarterly means and standard deviations are tabulated.

In the upper-income group boys were as usual taller and heavier than girls of the same age. In the lower-income group, however, girls over $3\frac{1}{2}$ tended to be slightly taller than boys. Among the Bantu the boys were taller, but the girls were heavier; whether this is due to any sex difference in feeding is not known, though it is stated [without details] that the boys had a higher incidence of clinical signs of malnutrition than the girls.

Children of the upper-income group were significantly taller and heavier at all ages than those of the lower-income group, the differences being from 3 to 5 lb. and 2 to $2\frac{1}{4}$ in. for boys and from 2 to $4\frac{1}{2}$ lb. and $1\frac{1}{4}$ to $2\frac{1}{2}$ in. for girls.

White lower-income boys and girls were slightly but not significantly heavier than Bantu boys and girls; they were also taller, and some of the differences were significant.—W. M. Deans.

912

ROUTIL, R. Über die körperliche Entwicklung von Schulkindern. (An Kärntner Landkindern erhobene Daten und deren Beurteilung.) [Physical development of schoolchildren. Evaluation of data for Carinthian country children.] *Öst. Ztschr. Kinderheilk.*, 1953, 8, 377-395. [Anthropol. Sammlung, Naturhist. Museum, Vienna.]

Tables are given for height and weight of 6365 boys and 6183 girls, aged from 6 to 15 years, from the district of Völkermarkt, Carinthia, in the years since 1948. All data are from school records.

Comparison with figures for 1052 boys and 1053 girls from the same region in 1935-36, for the ages from 7 to 14, showed that in 1948 the mean values for height were 1 or 2 cm. greater for all ages except boys of 12 and girls of 14. Bodyweight also was somewhat greater in 1948. The 1052 boys and 1053 girls from Völkermarkt district were compared with 1370 boys and 1342 girls from the district of Wolfsberg, which included rural and mountain villages. The social conditions of the Wolfsberg children were somewhat better, but they had further to go to school, 19 per cent. walking for over an hour. In both districts intelligence grading was about the same, and girls did somewhat better at school. Children in Wolfsberg were a little taller but not consistently heavier. In some villages development was much

poorer than in others. The height of girls, but not of boys, was unfavourably influenced to a small extent by long distance from school; weight was not affected. Where distance from school was great there were more children in the lowest grade of school performance. The bigger the child, the better the school performance.

A standard of normal height, weight and chest measurement is tabulated for every month of age from 7 to 15 years and 3 months for boys and to 14 years and 4 months for girls. The data were derived from 7753 boys and 7215 girls in the years 1935-38, and include those for Wolfsberg and Völkermarkt, with others for Klagenfurt and Villach and the country surrounding them.

E. M. Hume.

913

PECKOS, P. S. Caloric intake in relation to physique in children. *Science*, 1953, 117, 631-633. [Dept. Nutrit., Forsyth Dent. Infirmary Child., Boston, Mass.]

To discover whether differences exist in the energy intakes of children of different physiques, 86 subjects were selected from 350 who were enrolled at a clinic and were classified as endomorphs 28, mesomorphs 21 and ectomorphs 37 according to the system of Sheldon ("The Varieties of Human Physique", Harper, New York, 1940). Heights and weights were recorded, dietary data for a week were collected by the mothers and medical examinations were made. The range of ages was 6 to 14 years and the food intake of each child was expressed as a percentage of the National Research Council's allowances recommended for the particular age.

For energy intake the mean percentages with their standard deviations were: endomorphs, stocky or obese, 87.6 ± 24.9 ; mesomorphs, muscular, 99.8 ± 18.7 and ectomorphs, "skinny", 103.5 ± 18.8 .

Weaknesses that might have invalidated the results are considered, but the finding that the relation of the observed energy intake to body build is opposite to that expected is so definite that it cannot be ignored. For weight reduction an endomorph may require an energy intake so low as to endanger the supplies of specific nutrients in the diet.—D. Harvey.

914

WATANABE, T. Research on growth in girls according to age of puberty. *Nagoya J. Med. Sci.*, 1953, 15, 173-175. [Dept. Anat., Sch. Med., Univ. Nagoya.]

915

PRADO VERTIZ, A. Retardos de crecimiento (problema pediátrico). [Retardation of growth

(the paediatric problem).] *Rev. española Pediat.*, 1953, 9, No. 51, 597-610. [Univ. Mexico.] French, English and German summaries.

A review.

916

GREULICH, W. W., CRISMON, C. S. and TURNER, M. L. (with GREULICH, M. L. and OKUMOTO, Y.) **The physical growth and development of children who survived the atomic bombing of Hiroshima or Nagasaki.** *J. Pediat.*, 1953, 43, 121-145. [Dept. Anat., Stanford Univ. Sch. Med., Calif.]

Under the auspices of the Atomic Bomb Casualty Commission, children who had been in Hiroshima and Nagasaki at the time of the atomic bombing, and most of whom had a history of epilation and radiation illness, were weighed and measured and their skeletal ages were assessed by X-ray photography in 1947 or 1948 and again in 1949 or 1950, or both, and were compared with children from Kure and children who were in Nagasaki in 1948 and 1950 but not at the time of the bombing.

The exposed and control groups were matched for ages (from 7 to 13 in 1947) and most groups contained between 100 and 200 boys or girls. The results were also evaluated relative to standard tables for Japanese children based on data collected in the SCAP Nutrition Survey of 1946-47. The findings are presented in tables and graphs.

No significant difference in height or weight was found between children exposed in Nagasaki and Nagasaki controls. In 1947 Hiroshima boys were significantly shorter and lighter than Kure boys and in 1949 significantly shorter but not significantly lighter; no significant difference was found for the girls. All groups were significantly below the standards in weight, and many, including the exposed boys, were so in height. In skeletal age exposed Nagasaki children were retarded compared with Nagasaki controls and Hiroshima children compared with Kure children, the differences being significant for boys but not for girls. It is concluded that growth and development were adversely affected by exposure to atomic bombing and some of the effects were still evident 5 years later in spite of great improvement of the food supply and general economic conditions in the interval.—W. M. Deans.

917

VENGE, O. **Studies of the maternal influence on the growth in rabbits.** *Acta Agric. scand.*, 1953, 3, 243-291. [Inst. Animal Breeding, Royal Agric. Coll. Sweden, Upsala.]

The rabbits used were of a small breed, the Polish, and two large breeds, the Blue Vienna and Flemish Giant, and reciprocal crosses between small and large breeds. Fertilised ova of pure

breeds and crosses were also transplanted from small to large mothers and *vice versa*.

The larger litters and the larger young, when nursed by small mothers, were undernourished during the first 3 weeks after birth. When they began to eat solid food the growth rate increased, but they were unable to catch up with the better nourished young in the next month. In cross-breeds and transplanted young the size of the nursing mother had more influence on growth than had litter size, but in purebred groups litter size was important, at least until weaning at 42 days.

In all groups except one a heavy birthweight was found to be correlated with a heavy weight at 56 days regardless of litter size; in purebred large rabbits litter size exerted more influence than with the others. Genetic constitution and maternal influence were considered to operate together on this relationship. In all groups stimulation of growth accompanied the supplementation of suckling by solid food, and the curves flattened out after weaning.

Maternal influence was strongest at first, but later the genetic growth potentialities controlled the size attained. There was no evidence of persistent maternal influence, either cytoplasmic or environmental. Genetic differences were most strongly manifested when nutrition was good.

D. Duncan.

918

NAKAJIMA, T. and SUGITA, T. [On the influence of the feed upon bones. 8. Effect of rice- and wheat-bran, and soya bean cake upon bones.] *Bull. Nat. Inst. Agric. Sci., Chiba* [G], 1953, No. 6, 29-35. In Japanese: English summary.

For the two previous parts see Abst. 3332, Vol. 23.

8. Adult rabbits on a diet of rice- and wheat-bran developed osteomalacia accompanied by rickets. The addition of soya bean cake to the diet improved the condition of the bone, but the rickets persisted. It is concluded that the nutrients of soya bean cake are insufficient to complete the proliferative zone of the epiphysis.

J. S. Thomson.

See also Absts. 156, 1264.

REPRODUCTION AND LACTATION: MAMMALS

919

BERLIN, N. I., GOETSCH, C., HYDE, G. M. and PARSONS, R. J. **The blood volume in pregnancy as determined by P³² labeled red blood cells.** *Surg. Gynecol. Obstet.*, 1953, 97, 173-176. [Donner Lab. Med. Phys., Univ. California, Berkeley.]

Blood volume was measured by the ³²P method of Berlin *et al.* (*Amer. J. Med.*, 1950, 9, 747) once in each of 157 normal pregnant women and 34 women *post partum*, all of whom were receiving Fe by mouth. The results are tabulated and shown

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graphically in comparison with values for non-pregnant women (Abst. 2025, Vol. 21).

Total red cell volume was at a low level in the second month of pregnancy and rose to a peak about 270 ml. above non-pregnant values in the ninth month; it fell again during the last month and at delivery, and 6 weeks later was still 140 ml. below normal. Plasma volume rose steadily to a peak about 1200 ml. above non-pregnant levels in the ninth month and then fell before and immediately after delivery, but was still 100 ml. above normal 6 weeks later. Total blood volume fell during the first 2 months and then followed the rise and fall in plasma volume; at delivery there was a drop of 1100 ml. to about the normal value.

These results indicate that there is true anaemia during the first 6 months of pregnancy. Whether it is due to a decrease in the rate of formation of red cells, or a decrease in their life span, or both, is not yet known.—W. M. Deans.

920

TATUM, H. J. **Blood volume variation during labor and early puerperium.** *Amer. J. Obstet. Gynecol.*, 1953, **66**, 26–35. [Dept. Obstet. Gynaecol., Sch. Med., Louisiana State Univ., New Orleans.]

Serial plasma volume estimations were made by the T 1824 method in 45 negro patients during the final stages of labour and the early hours of the puerperium. In most a transient rise, average 2.67 ml. plasma per lb. bodyweight, occurred about the time of delivery of the placenta. Since the haematocrit did not change, this presumably represented a temporary increase of circulating whole blood of the order of 900 ml. No similar change was observed in 8 caesarean deliveries under local anaesthesia. Within about 2 hr. after delivery in both series, plasma volume decreased by about 3.7 ml. per lb. bodyweight, again without change in the haematocrit. The reason for these apparent changes is obscure.—A. M. Thomson.

921

RIVERA PÉREZ, L. **Diabetes y obesidad maternas en relacion con las alteraciones fetales (hipermegalia fetal y otras.)** [**Diabetes and obesity in the mother in relation to abnormalities in the foetus (foetal overgrowth and others.)**] *Rev. clín. española*, 1953, **50**, 149–154. [Hosp. Prov., Alicante.] English, German and French summaries.

A short review.

922

WESTERMARCK, H. W. **Changes in the minerals and trace elements as well as in the protein fractions and in the eosinophil count in the blood of cows during paresis and partus after**

ACTH administration. *Nord. Vet.-Med.*, 1953, **5**, 609–635. [Dept. Pharmacol., Vet. Coll., Helsinki.] German and Swedish summaries.

923

MASOERO, P. **Sterilità e habitat.** 4. 5. [**Sterility and habitat.** 4. 5.] *Riv. Zootec.*, 1953, **26**, 169–172; 208–211 (to be continued). [Ist. Zootec. Gen., Univ. Turin.]

For previous parts see Abst. 5323, Vol. 23.

Temperature, humidity, light, altitude, wind and atmospheric electricity are discussed with reference to their direct and indirect effects on the reproduction of animals.—T. D. Bell.

924

ROMBAUTS, P., BOURDEL, G. and JACQUOT, R. **Les facultés anabolisantes des femelles gestantes.** [**Anabolic powers of pregnant females.**] *C.R. Acad. Sci.*, 1953, **236**, 2543–2545.

Female rats received to appetite a diet containing casein supplemented with cystine 22, sucrose 25, starch 26, mixed fats 20, minerals 4, cellulose 2 and complete vitamin mixture 1 per cent. After a month they were mated; they were killed one day before the expected date of parturition. The uterus and contents were weighed and analysed for N, Ca and P. Three non-pregnant controls were similarly fed and the N, Ca and P balances of all animals were estimated throughout the experiment. The controls maintained their weight and the pregnant animals gained about 41 per cent. or, without the uterus and its contents, 20 per cent. of their initial weight. The average N, Ca and P retentions of the pregnant animals, after deducting the amounts present in uterus and contents, were 1740, 558 and 347 mg., compared with 1110, 340 and 230 for the controls.—W. Godden.

925

CURTISS, C. **Effects of a low protein intake on the pregnant rat.** *Metabolism*, 1953, **2**, 344–353. [Ziskind Res. Labs., New England Centre Hosp., Boston, Mass.]

Diets high or low in protein with different fat and NaCl contents were given to female rats after mating. Animals were killed on the 22nd day of gestation or 24 hr. after delivery. Serum protein was estimated before death. Fat content and weight of liver were estimated and the number of foetuses was recorded. Diets contained casein 20, 5 or 3, fat 38 or 5, U.S.P. salt mixture 4, NaCl 0, 2 or 4, sugar to 100 and supplements of vitamins A, D, E, B₁ and B₆, riboflavin and pantothenic acid. Choline chloride was added to a high- or low-protein diet low in fat and high in NaCl. Animals given high-fat diets were restricted to 10 g. food daily, others to 15 g. There was no significant difference in energy intake between

high- and low-protein groups. Addition of choline to a low-protein diet decreased food consumption.

In rats given low-protein diets there was a high incidence of uncompleted pregnancies associated with loss of weight during the first 2 weeks. At term rats given low-protein diets were thin and showed low serum protein and underdevelopment of mammary glands. Fat, choline and NaCl intakes did not affect fertility. Addition of NaCl to low-protein diets further reduced serum protein and there was a high incidence of oedema in the 3rd week. Fatty liver occurred in both high- and low-protein groups. Addition of choline prevented the occurrence of fatty liver and caused a rise of serum protein and reduction of oedema in rats on low-protein, high-salt diets.

The results are discussed in relation to pregnancy toxæmia in women.—F. C. Aitken.

926

DAVIS, R. F., LOOSLI, J. K. and WARNER, R. G. Are there "unidentified lactation factors" for cows? *J. Dairy Sci.*, 1953, **36**, 581. *Proc.* [Cornell Univ., Ithaca, N.Y.]

927

SAARINEN, P. Lehmän veriplasman eräiden lipoidiaineosien vaikutuksesta maitorasvan muodostukseen. [Effect of some lipid components of blood plasma in the cow on production of milk fat.] *Acta agral. fenn.*, 1944, **57**, No. 2, 1-131. German summary.

This is a detailed report of 4 experiments in which 337 samples of blood or milk were taken from 54 cows for analysis. Consecutive milkings were at 4- or 6-hr. intervals during a 24-hr. period and blood samples were taken from the coccygeal artery and the udder vein half way between milkings, which were by hand. The cows were fed twice daily. The lipids were obtained from oxalated plasma samples by extraction with ether and light petroleum under regulated conditions as detailed. The components of the lipid fraction showed considerable variation in samples from the same cow over relatively short intervals, depending on the time of day and the feeding. Excessive feeding with foods rich in fat produced an increase in the lipid fraction and in its components, particularly cholesterol, in the blood plasma. Under such conditions fatty acids were present of much higher molecular weight, which seldom occurred in the milk fat.

A comparison of the hourly milk secretion and milk fat yield, as calculated from a 6-hr. period, with the lipid content of the blood plasma obtained midway between successive milkings showed that there was a positive correlation between them, and especially between the cholesterol fatty acid esters and the amount of milk and

fat produced. On the basis of results for the 4 experiments the correlation with the quantity of milk fat was $r = +0.544 \pm 0.038$ and with the yield of milk $r = +0.627 \pm 0.033$. There were variations in these coefficients from experiment to experiment, owing partly to experimental conditions and partly to defects in the analytical methods. A correction could be made if only such fatty acids in the plasma as occur in normal milk fat were included in calculating the coefficients.—W. Godden.

See also Absts. 614, 662, 778, 865, 949, 1209, 1104, 1264, 1283, 1305, 1306.

REPRODUCTION: BIRDS

See Abst. 615.

SENESCENCE

928

SAXTON, J. A. (JR.), SPERLING, G. A., BARNES, L. L. and McCAY, C. M. Pathologic studies of rats fed different amounts of fluid throughout life. *J. Gerontol.*, 1953, **8**, 255-263. [Lab. Animal Nutrit., Cornell Univ., Ithaca, N.Y.]

The experimental procedure was described by McCay *et al.* (Abst. 2640, Vol. 22). Pathological studies were made on 230 of the rats used in the experiments there discussed, and microscopic examination was possible in 166.

Chronic pneumonia with bronchiectasis was the most important cause of death in all groups, irrespective of age or diet. Middle-ear disease increased in frequency with advancing age, and was least common when the beverage was coffee. Chronic nephrosis was more frequent and severe on high-protein diets, had its lowest incidence on the all-milk diet and was commoner in males than in females in all groups, and its incidence increased with age. Calcium deposits in the kidneys occurred in 66 per cent. of females and 21 per cent. of males and were most frequent on the milk diet and thus were not related to nephrosis. Tumours of all types occurred in about equal numbers in males and females and increased in frequency with age. The only dietary effect was a low incidence of pulmonary lymphosarcoma in females on milk diet. Stomach ulcers occurred in 13 rats, and 5 of these had pituitary tumours. Hair-balls were found in 26 of 58 rats on milk diet and in no other group, and may have been associated with a craving for bulk with the liquid diet. All the groups were conspicuously free of vascular disease in old age compared with human beings.

The results suggest that more drastic modifications of diet than those used would be necessary to alter significantly the average life span or the pattern of ageing. Minor modifications in the pattern might be produced. The significance of the findings is discussed in relation to human senescence.—D. Duncan.

See also Absts. 973, 1124.

N.A. and R., January 1954

EXPERIMENTAL STUDIES OF IMMUNITY AND MICRO-ORGANISMS

929

ANDREONI, O. Contributo allo studio della flora batterica intestinale del neonato. [**Bacterial flora in the intestine of the newborn.**] *Boll. Ist. sieroterap. milan.*, 1953, **32**, 235-238. [Ist. Igiene, Univ. Milan.] English summary.

Meconium or faeces from 70 healthy infants aged from a few min. to 10 days was investigated during the winter for the presence of the family *Enterobacteriaceae* and of the genus *Staphylococcus*. Up to 18 hr. after birth, material from all of 29 infants was sterile except for one culture of *Staphylococcus* in the 4th hr., one of *Bacterium coli* in the 10th hr. and one of *Proteus mirabilis* in the 11th. From the 18th hr. *Bact. coli* var. *neapolitanum* became increasingly frequent, with other organisms. No sterile specimen was obtained from any infant older than one day. In all, 38 strains of enterobacteria and 12 of staphylococci were isolated.—E. M. Hume.

930

MCCARTHY, E. F. and MCDUGALL, E. I. **Absorption of immune globulin by the young lamb after ingestion of colostrum.** *Biochem. J.*, 1953, **55**, 177-182. [Lister Inst., London.]

Some Cheviot, Blackface and halfbred lambs ran with their dams, others received colostrum from their dams or other ewes after delays of from 12 hr. to 9 days after birth, during which cow's milk was given. A few lambs got no colostrum. The ewes were immunised with *Salmonella typhosa* antigen, beginning 21 days before the expected lambing date. The ewe's serum and colostrum and the lamb's serum were examined at different dates after birth, the N fraction being estimated by salt precipitation and the antibody titre being estimated. The lamb's serum was also examined by electrophoresis, and qualitative tests for protein and globulin as well as antibody titre tests were applied at intervals to urine samples.

There was an increase in serum globulin, largely due to one electrophoretic component, and an appearance of antibody in lamb serum when colostrum was given up to 29 hr. but not at 48 hr. or more after birth. After the ingestion of colostrum lambs showed marked proteinuria characterised by the presence of globulin and antibody. The results for colostrum taken from 2 ewes 3 or 12 days before birth of the lamb suggest that antibodies may be secreted in the colostrum over a relatively short period immediately before lambing.

W. Godden.

931

GALL, L. S., HUHTANEN, C. N., SAUNDERS, R. and SCHMIDT, W. **Comparison of rumen flora and**

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environment in roughage vs. grain-fed animals. *J. Dairy Sci.*, 1953, **36**, 587-588. *Proc. [Nat. Dairy Res. Labs., Oakdale, N.Y.]*

932

BRYANT, M. P. and BURKEY, L. A. **The bacterial flora in the rumen of heifers fed a ration of alfalfa silage.** *J. Dairy Sci.*, 1953, **36**, 588-589. *Proc. [Bur. Dairy Indust., U.S. Dept. Agric.]*

933

BROWN, R. E. **Rumen studies on normal and ketotic cows.** *J. Dairy Sci.*, 1953, **36**, 597. *Proc. [Univ. Maryland, College Park.]*

934

GUTIERREZ, J. **Numbers and characteristics of lactate utilizing organisms in the rumen of cattle.** *J. Bacteriol.*, 1953, **66**, 123-128. [Dept. Bacteriol., State Coll. Washington, Pullman.]

Twenty-four strains of propionic acid bacteria were isolated from the rumen contents of normal dairy cows or cows with a fistula. Volatile acids were produced from lactate and in 5 strains tested the acids were found to be acetic and propionic. Seven strains isolated from silage or hays had fermentation characteristics similar to those of strains isolated from the rumen. Five strains of rumen organisms were found to grow on media incorporating infusions made from timothy hay and cottonseed meal. Four strains were isolated from soil.

These observations show that propionic acid bacteria are widely spread and it is suggested on account of the number present in the rumen, average 1.3×10^9 per ml., that they play an active part in the production of acetic and propionic acids. The rumen organisms, however, grew best under anaerobic conditions and oxygen inhibited growth to the extent that a stab culture exposed to the air showed only very slight surface growth. [It is not clear in the text whether the hay and soil strains grew under aerobic conditions, but] owing to the large numbers found on hay the possibility of their active phase being on hay rather than in the rumen is suggested.—A. T. Phillipson.

935

ANDERSSON, P. **Aureomycinets inverkan på våmfloran hos mindre idisslare. [Effect of aureomycin on the rumen flora of small ruminants.]** *Nord. Vet.-Med.*, 1953, **5**, 636-652. [Vet. Högsk., Stockholm.] English and German summaries.

Literature is reviewed. In experiments, described in detail, on 2 goats and 2 sheep aureomycin by mouth in less than therapeutic amounts caused an abrupt failure of appetite, which was restored only by omission of the antibiotic and transfer of rumen contents from a healthy animal. Rumen micro-organisms are extremely sensitive and digestion stops. One of the sheep, not given normal rumen contents soon enough, died. Some accommodation occurs when still smaller amounts are given. When aureomycin is used for therapeutic purposes, rumen contents must be given at short intervals.—I. Leitch.

936

CHANCE, C. M., SMITH, C. K., HUFFMAN, C. F. and DUNCAN, C. W. **Antibiotics in rumen digestion and synthesis. 3. The effect of aureomycin on rumen microorganisms, with special reference to the streptococci and coliform groups.** *J. Dairy Sci.*, 1953, **36**, 743-751. [Dairy Dept., Michigan Agric. Exp. Stat., E. Lansing.]

Two steers with rumen fistula were compared when feeding on a ration of 4 lb. maize and 15 lb. alfalfa-brome hay with or without aureomycin added at the rate of 0.5 or 1.0 g. daily. The pH of the rumen contents was lower when no aureomycin was given; streptococci, counted by serial dilution using dextrose azide broth, were reduced in number when aureomycin was given, but coliform organisms, counted by serial dilution using lauryl sulphate tryptose broth, increased in one animal. The differences were irregular and small. Total counts in the rumen rose significantly with increasing aureomycin intake. Total bacterial count of the faeces fluctuated considerably, but little difference was seen in the streptococcus or coliform count.—A. T. Phillipson.

937

FRANCOIS, A. C., LEROY, A. M. and ZELTER, S. Z. **Antibiotiques et phénomènes digestifs chez le ruminant. [Antibiotics and digestive phenomena in the ruminant.]** *C.R. Acad. Sci.*, 1953, **236**, 2547-2549.

The effect of aureomycin and other antibiotics on rumen fermentation was tested *in vitro*: 250 ml. rumen liquor was added to 29 g. alfalfa hay in 200 ml. buffer solution and incubated at 39° C. for 48 hr. under anaerobic conditions. The losses of cellulose and other carbohydrates yielding reducing substances on hydrolysis were estimated, and the quantity of short-chain fatty acid formed.

Aureomycin, 0.25 to 2 mg., reduced fermentation of cellulose and, to a less extent, other hydrolysable carbohydrates, but the results varied considerably. Penicillin salts produced little change, except that the procaine salt stimulated

cellulose fermentation. Chloramphenicol, dihydro-mycin and bacitracin had no effect, and streptomycin depressed fermentation.—A. T. Phillipson.

938

SIROTNAK, F. M. and BROWN, R. E. **The dissimilation of amino acids by bovine rumen bacteria.** *J. Dairy Sci.*, 1953, **36**, 588. *Proc.* [Univ. Maryland, College Park.]

939

MCNEILL, J. J., DOETSCH, R. N. and ROBINSON, R. Q. **Nutritional requirements of bovine rumen bacteria.** *J. Dairy Sci.*, 1953, **36**, 588. *Proc.* [Univ. Maryland, College Park.]

940

SKEGGS, H. R., DRISCOLL, C. A., TAYLOR, H. N. and WRIGHT, L. D. **The nutritional requirements of *Lactobacillus bifidus* and *Lactobacillus leichmannii*.** *J. Bacteriol.*, 1953, **65**, 733-738. [Res. Div., Sharp and Dohme, Inc., West Point, Pa.]

941

MUNDT, W. **Die Bedeutung der Darmflora unserer Haustiere unter besonderer Berücksichtigung einer Zugabe von Antibiotica in das Futter. [The significance of the intestinal flora of domestic animals with special reference to the addition of antibiotics to the feed.]** *Arch. Tierernährung*, 1952, **3**, 188-194.

A brief general discussion.

942

SCALETI, J. V., KULP, W. L. and CLEVERDON, R. C. **Effect of terramycin on fecal microflora of rats. 2. Therapeutic level of terramycin.** *Proc. Soc. Exp. Biol. Med.*, 1953, **83**, 599-602. [Dept. Bacteriol., Univ. Connecticut, Storrs.]

Balanced basal, high-protein low-carbohydrate and high-carbohydrate low-protein rations were given to groups of albino rats, with or without terramycin at the rate of 666 mg. per kg. diet.

Terramycin reduced the total aerobic and anaerobic bacterial counts in the faeces, irrespective of the ration; lactobacilli were also reduced in numbers. *Bacterium coli* and *Proteus* spp. increased in numbers and so, to a less extent, did streptococci. The only variation induced by the rations was that streptococci were fewer in the high-protein ration than in the other two.

A. T. Phillipson.

943

LEIN, J., PUGLISI, T. A. and LEIN, P. S. **Unsaturated fatty acid metabolism in *Neurospora*.** *Arch. Biochem. Biophys.*, 1953, **45**, 434-442. [Dept. Zool., Syracuse Univ., N.Y.]

N.A. and R., January 1954

Mutant strains of *Neurospora crassa* were isolated which grew only in media containing unsaturated fatty acids. Four strains grew in media containing oleic, linoleic or linolenic acid, the fifth responded only to linolenic acid. None of the mutants grew in media containing acetic, butyric, caproic, capric, lauric, myristic, palmitic or stearic acid, nor did they respond to arachidonic acid.

It is suggested that the unsaturated fatty acids are synthesised by a metabolic route distinct from that of saturated acids and that they are synthesised in the order oleic → linoleic → linolenic. It is noteworthy that arachidonic acid did not support growth in *Neurospora*, although it relieves signs of unsaturated essential fatty acid deficiency in mammals.—G. A. Garton.

944

McCoy, T. A. and WENDER, S. H. **Some factors affecting the nutritional requirements of *Streptococcus faecalis*.** *J. Bacteriol.*, 1953, **65**, 660–665. [Lab. Res. Div., Samuel Roberts Noble Found., Inc., Ardmore, Okla.]

The stock of culture of *Streptococcus faecalis*, strain ATCC 6057, was maintained by 2 transfers weekly on a medium containing, per cent., glucose 1.0, yeast extract 1.0, peptone 0.8 and agar 1.5. Growth rate was estimated turbidimetrically. A suitable basal medium was developed from which individual amino-acids could be omitted.

The amino-acids essential for this organism were arginine, glutamic acid, glycine, histidine, isoleucine, leucine, lysine, methionine, threonine, tryptophan and valine. Alanine, cystine and

phenylalanine were stimulatory, and aspartic acid, asparagine, hydroxyproline, norleucine, norvaline, proline and tyrosine apparently not essential. Serine might be essential or stimulatory; studies suggested that autoclaving might produce serine from cystine.—D. Duncan.

945

HORN, M. J., BLUM, A. E., GERSDORFF, C. E. F. and WARREN, H. W. **Sources of error in microbiological determinations of amino acids in acid hydrolysates. 1. Effect of humin on amino acid values.** *J. Biol. Chem.*, 1953, **203**, 907–913. [Bur. Human Nutrit. Home Econ., U.S. Dept. Agric., Washington, D.C.]

An active material that increased the growth of *Leuconostoc mesenteroides* and *Streptococcus faecalis* in amino-acid estimation was found in acid hydrolysates of cereals and legumes prepared by several standard procedures, but not in hydrolysates of pure proteins. The material could be removed by filtering the hydrolysate at pH 4 through fritted glass, or by treating the test substance with acid and evaporating to dryness before hydrolysis.

The effect was most marked when arginine, isoleucine, lysine or valine was limiting, growth being increased by about a third; it was not noticeable when leucine or possibly threonine was limiting; intermediate effects were noted with histidine, methionine and phenylalanine. High concentrations of pyridoxamine accentuated the effect when lysine or phenylalanine was limiting.

C. Warner.

See also Absts. 135, 454, 456, 574, 757, 1251, 1252, 1350, 1351.

MISCELLANEOUS FEEDING EXPERIMENTS

946

HARTLES, R. L. and McLEAN, N. D. **A note on the rapidity of the production and removal of lactic acid following the introduction of a 10 per cent. glucose solution into the mouth.** *Brit. Dent. J.*, 1953, **95**, 63–65. [Dept. Biochem., Sch. Dent. Surg., Univ. Liverpool.]

Glucose solution, 5 ml. at 10 per cent. (w/v), was held in the mouth for 5 min. before being swallowed. Saliva was analysed for lactic acid before and afterwards. In 5 subjects lactic acid reached its greatest concentration within 5 to 7 min., and in the remaining 4 within 10 to 12 min. The production and removal of lactic acid and the role of salivary buffers are discussed.—D. Duncan.

947

KENNEDY, G. C. **The effect of lesions in the hypothalamus on appetite.** *Proc. Nutrit. Soc.*, 1953, **12**, 160–165. [Clin. Endocrinol. Res. Unit, Royal Infirmary, Edinburgh.]

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948

WARNER, R. G., BERNHOLDT, H. F., GRIFFIN, C. H. and LOOSLI, J. K. **The influence of diet on the development of the ruminant stomach.** *J. Dairy Sci.*, 1953, **36**, 599. *Proc.* [Cornell Univ., Ithaca, N.Y.]

949

CHENG, E., STORY, C. D., PAYNE, L. C., YODER, L. and BURROUGHS, W. **Detection of estrogenic substances in alfalfa and clover hays fed to fattening lambs.** *J. Animal Sci.*, 1953, **12**, 507–514. [Iowa Agric. Exp. Stat., Ames.]

In experiments with lambs given clover or alfalfa hay (Culbertson *et al.*, *Iowa Exp. Stat. A.H. Leaflet* No. 181, 1952) no stimulation of growth was observed, a finding which prompted the present study. The clover hay was a mixture of red, alsike and ladino, with the first predominating. Purified extracts were injected into immature female mice. The oestrogenic activities of 1 lb.

clover and alfalfa hay were each equivalent to 0.9 μ g. stilboestrol, but the potency increased to 1.95 for second-cut clover and 2.72 μ g. for third-cut alfalfa. Other feeds tested and found to have no activity were bluegrass, bromegrass, ladino clover, wheat plant, soya bean meal, yellow maize and wheat grain.—D. Harvey.

950

CHENG, E., STORY, C. D., YODER, L., HALE, W. H. and BURROUGHS, W. **Estrogenic activity of isoflavone derivatives extracted and prepared from soybean oil meal.** *Science*, 1953, **118**, 164-165. [Iowa Agric. Exp. Stat., Ames.]

Genistin, 5:4'-dihydroxy-7-glucosidoisoflavone, was isolated from solvent-extracted soya bean meal. Genistein, 5:7:4'-trihydroxyisoflavone, was prepared by hydrolysis of genistin. Immature female mice in 11 groups of 6 were used: one group, untreated, acted as control; 2 groups received injections of 0.02 or 0.04 μ g. stilboestrol, and the other groups were given genistin or genistein by mouth in doses of 2.5 or 5.0 mg., or subcutaneous injections of 1 or 2 mg. The treatments were given once daily for 4 days, the mice were killed 24 hr. after the last dose and their uteri were removed, fixed and weighed.

Both test substances by mouth in both doses increased uterine weights. Injections of genistein at both levels and of genistin at the 2 mg. level had a similar effect, and the responses were similar to those produced by injections of stilboestrol at both levels used. On this basis it was estimated that genistein had an oestrogenic activity approximately 1/50,000 that of stilboestrol. Genistin activity was rather less on a weight basis, but was equal on a molecular basis.

P. C. Jowsey.

951

BELL, J. M. and WILLIAMS, K. **Growth depressing factors in rapeseed oilmeal.** *Canad. J. Agric. Sci.*, 1953, **33**, 201-209. [Dept. Animal Husb., Univ. Saskatchewan, Saskatoon.]

The growth of mice was studied on diets containing 27, 18, or 9 per cent. or no rapeseed meal, replacing linseed meal as a source of protein, or 22 per cent. water-extracted rapeseed meal. As sub-treatments 0.1 per cent. iodinated casein, 0.1 per cent. thiouracil and 50 μ g. vitamin B₁₂ per kg. feed were added singly or together. At the highest level of rapeseed meal growth was depressed. Only males responded to all the changes in level of rapeseed meal when iodinated casein was included, and at high levels the latter seemed to accentuate the growth-depressing effect. Water-extracted rapeseed meal did not depress growth. Thiouracil depressed growth on the water-extracted rapeseed and linseed meal diets, but this was counteracted by iodinated casein.

There was no definite response to vitamin B₁₂. It was concluded that up to 18 per cent. rapeseed meal may be included in the ration without causing depression of growth.

In the second experiment responses to levels of thiouracil from 0.01 to 0.32 per cent. were studied; there was no significant difference between sexes.

Flavouring agents added to rations with up to 51 per cent. rapeseed meal were studied in the third experiment. No advantage was obtained by the addition. Animal-protein factor improved growth rate on both linseed and rapeseed meals, so it was not thought to counteract directly the growth-depressing substance in the latter.

The nature of the growth-depressing substance is discussed.—T. D. Bell.

952

TRIA, E. and BARNABEI, O. **An unidentified growth-factor for yeast and hyperthyroid rats.** *Nature*, 1953, **172**, 203-204. [Inst. Gen. Physiol., Univ. Ferrara.]

When dried liver is treated with acetone, the extract evaporated to dryness and the residue treated with water, the extract obtained stimulates the growth of yeast.

In rats given a diet of soya flour, sugar, vegetable oil and salt mixture supplemented with 0.25 per cent. thyroid powder and a mixture of vitamin B₁, vitamin B₆, nicotinamide, inositol, *p*-amino-benzoic acid and folic acid there was a growth response to the extract. Hyperthyroid rats given vitamin B₁₂ responded also.

Properties of the extract are described which indicate that the active principle is not vitamin B₁₂ nor is it related to streptogenin, thioctic acid or the substance reported by Dietrich, Monson and Elvehjem (Abst. 418, Vol. 23).—F. C. Aitken.

953

TAUCHI, H., HAYASHI, K. and SEKIYA, M. **Experimental studies in the rabbit of changes in the weight of the liver, in the volume and number of liver cells with progress of starvation and recovery from it.** *Nagoya Med. J.*, 1953, **1**, 95-104. [Dept. Pathol., Med. Sch., Nagoya City Univ.]

About 100 rabbits were used; some were allowed to starve to death without food or water and others were given food after a period of starvation lasting from 15 to 20 days. The results of the measurements are given in a series of curves for time of starvation or recovery.

The rates of loss of bodyweight during starvation and of gain after re-feeding were greatest in the early days of the regime. During starvation loss of liver weight was relatively greater than loss of bodyweight and was greater in summer than in winter.

During starvation cell atrophy appeared earlier and was greater than nucleus atrophy and was relatively greater than the loss of weight of liver. It was also greater in summer than in winter and more marked in the centre than in the periphery of the lobule. During recovery, changes in cell volume occurred before and were relatively greater than changes in liver weight. The increase in volume was such that hypertrophy occurred, and this may have compensated for the decrease found in the number of cells at this time.

D. Harvey.

954

LAING, J. A. and TRIBE, D. E. **Dietary liver necrosis and testicular degeneration.** *Proc. Nutrit. Soc.*, 1953, **12**, vi-vii. [Vet. Sch., Univ. Bristol.]

Experiments with rats.

955

OWEN, J. A. (Jr.), PARSON, W. and CRISPELL, K. R. **Dietary dilution studies in gold thioglucose induced obesity in the mouse.** *Metabolism*, 1953, **2**, 362-366. [Dept. Int. Med., Univ. Virginia, Charlottesville.]

956

GREENWOOD, D. A., HARRIS, L. E., BIDDULPH, C., BATEMAN, G. Q., BINNS, W., MINER, M. L., HARRIS, J. R., MANGELSON, F. and MADSEN, L. L. **Feeding rats tissues from lambs and butterfat from cows that consumed DDT-dusted alfalfa hay.** *Proc. Soc. Exp. Biol. Med.*, 1953, **83**, 458-460. [Utah Agric. Exp. Stat., Logan.]

The tissues of lambs and the butterfat from cows which had been fed for 113 to 120 days on alfalfa dusted with DDT at a rate of up to 4 lb. per acre were given to rats for 12 to 16 weeks. Other rats were given the tissues of lambs which had received DDT in capsules at a rate of up to 200 p.p.m. hay. The concentration of DDT in the diet of the rats ranged from 0.1 to 30 p.p.m. on a dry basis. There was no significant difference in food intake or rate of growth of the rats on the highest and lowest concentrations and no sign of poisoning or change in liver or kidney. High

concentrations of DDT in the diet gave greatest storage in the body fat.—J. S. Thomson.

957

WYNN, W., HALDI, J., SHAW, J. H. and SOGNAES, R. F. **Difference in the caries-producing effects of two purified diets containing the same amount of sugar.** *J. Nutrition*, 1953, **50**, 267-274. [Dept. Physiol., Sch. Dent., Emory Univ., Ga.]

For further study of the difference in incidence of caries between Wistar and Long Evans strains of rats (Abst. 2665, Vol. 22) 2 experiments were made with the diets in use at Harvard and Emory. Both were high-sucrose diets with 64 per cent. sucrose, but they differed in details which affected their fat, protein, mineral and vitamin contents. In the first experiment rats of Wistar strain and in the second cotton rats were used. In the second experiment littermates formed a control group on a commercial stock diet.

Microscopic examinations showed an incidence of caries in both kinds of rats which was much greater with the Harvard than with the Emory diet. In the cotton rats the incidence was much lower with stock diet than with either of the purified diets.—D. Harvey.

958

MCCLURE, F. J. and FOLK, J. E. **Skim milk powders and experimental rat caries.** *Proc. Soc. Exp. Biol. Med.*, 1953, **83**, 21-26. [Nat. Inst. Dent. Res., Bethesda, Md.]

The incidence of caries was studied in rats of Sprague Dawley and Holtzman strains with 9 diets containing different milk powders at the 35 per cent. level, glucose 18, maize starch 45 and dried liver 2 per cent. Rats were fed to appetite from weaning until death or 90 days of age. The incidence of caries was highest with 2 milk powders prepared by commercial roller-processing, and was similar when one of these powders was given with 63 per cent. glucose and no maize starch. When 3 commercial powders were subjected to heat treatment in the laboratory their cariogenic effects were consistently increased. Most of the caries was in lower teeth and on buccal surfaces.

D. Duncan.

GENERAL METABOLISM AND FEEDING HABITS OF ANIMALS OTHER THAN MAMMALS AND BIRDS

959

RICCERI, G. **La distribuzione della xantinossidasi negli organi delle diverse specie dei cheloni, studiata in relazione al diverso carattere del loro metabolismo azotato e purinico.** [Distri-

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bution of xanthine oxidase in the organs of different species of tortoise, in relation to their different types of nitrogen and purine metabolism.] *Boll. Soc. ital. Biol. sper.*, 1952, **28**, 1901-1903. [Ist. Fisiol., Univ. Catania.]

Extracts were made in Ringer solution of liver, kidneys, pancreas, muscles, heart, lungs, spleen, stomach and small and large intestines of 3 genera of tortoise. Uric acid was estimated in the extracts before and after incubation with xanthine in a suitable buffer at pH 7.6, an increase indicating the presence of xanthine oxidase. The enzyme was thus recognised in the small intestine of the freshwater tortoise, *Emys europaea*, in the kidneys and small intestine of the loggerhead turtle, *Thalasseochelys caretta*, and in the liver, kidneys and small intestine of the land tortoise, *Testudo graeca*.—E. M. Hume.

960

COULSON, R. A. and HERNANDEZ, T. **Glucose studies in Crocodilia.** *Endocrinology*, 1953, **53**, 311-320. [Dept. Biochem., Sch. Med., Louisiana State Univ., New Orleans.]

961

MANGILI, G. Primi dati sperimentali sull'alimentazione con idrolizzati di carne in Rettili anemici con fatti achilici. [First experimental data on feeding anaemic reptiles with achylia on beef hydrolysates.] *Quad. Nutrizione*, 1952, **12**, 341-348. *Proc.*

962

IVLEV, V. S. and IVLEVA, I. V. Opyt otsenki fiziologicheskoi polnotsennosti zhivogo korma (gorshechnyi cherv') pri vyrashchivanii molodi lososevykh. [Experiment for estimating the physiological richness of the live food *Enchytraeus albidus* for the rearing of young salmon.] *Zool. Zh.*, 1952, **31**, 855-860. [Latvinsk. Otdel V.N.I.R.O.]

On the basis of body composition, metabolic level, Hb, red cell count and leucocyte formula, it can be concluded that the breeding of young Baltic salmon is successful under pond and reservoir conditions in which *Enchytraeus albidus*, Henle is the basic food. This is confirmed by the successful wintering of the young fed on the worms. (From author's summary.)—W. Hughes.

963

CLARK, E. W. and CRAIG, R. **The calcium and magnesium content in the hemolymph of certain insects.** *Physiol. Zool.*, 1953, **26**, 101-107. [Div. Entomol. Parasitol., Univ. California, Berkeley.]

Micro-methods were used to estimate Ca and Mg in the haemolymph of 24 species of insect. No apparent phylogenetic relationship was revealed by the magnitude of the Ca:Mg ratio, which depended on feeding habits. Phytophaga showed low, and Haematophaga high, Ca:Mg

ratios. The high ratios were related to ability to concentrate the Ca from ingested blood. The problem of the amounts of free and bound Ca in the haemolymph is discussed and is considered to be a subject for further investigation.

A. M. Copping.

964

MITTLER, T. E. **Amino-acids in phloem sap and their excretion by aphids.** *Nature*, 1953, **172**, 207. [Agric. Res. Council, Unit Insect Physiol., Zool. Lab., Cambridge.]

Paper chromatography of willow phloem sap ingested by the aphid *Tuberolachnus salignus* and of honeydew excreted by the aphid showed that each amino-acid present in the phloem sap was present in smaller amounts in the honeydew. The amino-acid composition of the phloem sap depended on the stage of development of the plant.

F. C. Aitken.

965

DAY, M. F. and IRZYKIEWICZ, H. **Feeding behaviour of the aphids *Myzus persicae* and *Brevicoryne brassicae*, studied with radio-phosphorus.** *Austral. J. Biol. Sci.*, 1953, **6**, 98-108. [Div. Entomol., C.S.I.R.O., Canberra.]

966

POWNING, R. F. **Studies on the digestion of wool by insects. 8. The significance of certain excretory products of the clothes moth, *Tineola bisselliella*, and the carpet beetle, *Attagenus piceus*.** *Austral. J. Biol. Sci.*, 1953, **6**, 109-117. [Div. Entomol., C.S.I.R.O., Canberra.]

967

AGRELL, I. **The aerobic and anaerobic utilization of metabolic energy during insect metamorphosis.** *Acta physiol. scand.*, 1953, **28**, 306-335. [Dept. Zoophysiol., Univ. Lund.]

The changes in chemical composition during pupal metamorphosis were studied in the blowfly *Calliphora erythrocephala*.

Total N remains constant and amino-acid content is low and constant, which suggests that protein breakdown during histolysis does not proceed as far as amino-acids.

More than 95 per cent. of the total energy metabolism during metamorphosis derives from fat. Fat breakdown increases as metamorphosis progresses. A small amount of carbohydrate is also utilised. There is probably interconversion between fat and carbohydrate. During anaerobiosis no fatty acids are utilised, but glycogen decomposition is greatly increased, with formation of lactic acid and reducing sugar. More than 99 per cent. of the normal energy metabolism is blocked.

N.A. and R., January 1954

Oxygen consumption normally follows a U-shaped curve during metamorphosis and is directly related to tissue breakdown and formation. There is a corresponding decomposition and re-formation of oxidative enzymes.

Growth is complete some time before emergence, but metabolic activity continues to increase. This may be related to incorporation of soluble protein into the cellular structure, e.g., fixation of enzymes in the mitochondria; this is the period of differentiation. Different enzyme systems characterise the stages of metamorphosis. During histolysis the glycolytic system decreases and the tricarboxylic acid cycle increases in activity. During histogenesis this is reversed and during differentiation it is again reversed. There is little change in activity of the proteolytic enzymes measured at constant pH, but there is a decrease in pH during histolysis and an increase in the later stages which suffices to activate and then inactivate protein breakdown. The effects of anaerobiosis on the enzyme systems were studied. The phosphorus compounds were also studied and the results are fully discussed.—D. Duncan.

968

JODREY, L. H. **Studies on shell formation. 3. Measurement of calcium deposition in shell and calcium turnover in mantle tissue using the mantle-shell preparation and Ca^{45} .** *Biol. Bull.*, 1953, **104**, 398–407. [Dept. Zool., Duke Univ., Durham, N.C.]

A mantle-shell preparation from the oyster was used to study the formation of shell, using Ca^{45} . At least part of the Ca present in shell was taken directly from sea water by the mantle and did not enter the digestive and circulatory systems of the

organism. Most of the Ca in the mantle was inert, but that which was active had a rapid turnover.

R. Hill.

969

GUARDABASSI, A. and FERRERI, E. **Contributo allo studio dell'assorbimento dei lipidi: esperimenti su tratti intestinali di *Helix pomatia* isolati e sopravvissuti in soluzione fisiologica. [Absorption of lipids. Experiments with the intestine of *Helix pomatia*, isolated and surviving in physiological fluid.]** *Arch. Sci. biol., Bologna*, 1953, **37**, 287–305. [Ist. Anat., Univ. Turin.]

970

MOMENT, G. B. **The relation of body level, temperature, and nutrition to regenerative growth.** *Physiol. Zool.*, 1953, **26**, 108–117. [Goucher Coll., Baltimore, Md.]

The rate of posterior regeneration was measured in earthworms after section at different body levels. The worms were kept at 20°, 25° or 30° C. in soil or moist paper, and optimum regeneration occurred at 25° C. At all temperatures the rate of regeneration of distal was slower than that of proximal segments; this result is discussed with reference to the critical inhibitory voltage theory of growth limitation. The amount of new tissue formed was less in starved worms than in those in good soil.—A. M. Copping.

971

KRIJGSMAN, B. J. and TALBOT, F. H. **Experiments on digestion in sea-anemones.** *Arch. internat. Physiol.*, 1953, **61**, 277–291. [Univ. Cape Town.]

5. HUMAN DIET IN RELATION TO HEALTH AND DISEASE

DIET AND HEALTH

REQUIREMENTS

972

JOHNSTON, F. A. **Iron requirements of children.** *J. Amer. Dietetic Assoc.*, 1953, **29**, 758–761. [New York State Coll. Home Econ., Cornell Univ., Ithaca.]

973

FINZI, M. **Fondamenti di dietetica della senescenza. [Fundamentals of diet in old age.]** *Acta gerontol.*, 1953, **3**, 28–32. [Bologna.]

The principles of dietary adjustment in advancing years are discussed, with reference not only to changing requirements, but also to the physiological and psychological problems involved in meeting them.—D. Duncan.

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974

STIEGLITZ, E. J. **Nutritional problems in later maturity.** *Proc. Nat. Food Nutrit. Inst.*, December 1952; *U.S. Dept. Agric., Agric. Handbook No. 56*, 64–72. [Veterans' Admin., Washington, D.C.]

FEEDING OF INFANTS AND CHILDREN

975

OBES POLLERI, J. **Problemas practicos del prematuro. [Practical problems of prematurity.]** *Rev. española Pediat.*, 1953, **9**, No. 50 Extraord., 251–264. [Montevideo.] French, English and German summaries.

976

WILLI, H. Aktuelle Probleme der Frühgeborenen-enaufzucht. [Rearing of premature infants. Problems of today.] *Monatsschr. Kinderheilk.*, 1953, **101**, 132-138. *Proc.* [Zürich.]

977

ROMINGER, E. Stoffwechsel und Ernährung des frühgeborenen Kindes. [Metabolism and nutrition of the premature infant.] *Monatsschr. Kinderheilk.*, 1953, **101**, 138-146. *Proc.* [Kiel.]

978

FERREIRA, C., GARCÍA, L. and CORDEIRO FERREIRA, N. Aminoácidos en prematuros. [Amino-acids for premature infants.] *Rev. española Pediat.*, 1953, **9**, No. 50 Extraord., 313-324. [Lisbon.] French, English and German summaries.

A study of the feeding of premature infants showed that human milk alone is not the best food for rapid growth. The milk should always be supplemented with substances rich in protein and salts. Excellent results were obtained by the addition of 1 per cent. of a mixture of amino-acids, and it was shown by chromatography that administration of these acids produces a rapid rise in their concentration in the blood.

M. B. Richards.

979

SEELEMAN, K. and WATERSTRADT, K. Untersuchungen über Eiweisszusätze in der Ernährung der Frühgeborenen unter besonderer Berücksichtigung der Serumproteine. [Researches on adding protein to the diet of premature infants, with special reference to the serum proteins.] *Monatsschr. Kinderheilk.*, 1953, **101**, 219-222. [Kinderklin., Univ. Hamburg, Eppendorf.]

The effect on weight, on Hb value and on susceptibility to infections and digestive disturbances of giving Plasmon, a mixture of casein and calcium, or Nutramid, a protein hydrolysate fortified with essential amino-acids, was studied with 60 premature infants. The preparations were given to alternate subjects in addition to boiled human milk with added ascorbic acid, but no significant difference in response could be detected between the groups. Electrophoretic fractionation of the serum proteins of 30 of the infants when between 7 and 35 days old showed no significant difference between the groups in the amounts of total protein, albumin, globulin and γ -globulin. There was thus no evidence that casein or cow's milk was less satisfactory for premature infants than special mixtures of essential amino-acids.

A. M. Copping.

980

AXTRUP, S. Intravenous nutrition of premature infants with low body weights. *Acta paediat.*, 1953, **42**, 282-283. *Proc.*

981

HANSEN, J. D. L. and SMITH, C. A. Effects of withholding fluid in the immediate postnatal period. *Pediatrics*, 1953, **12**, 99-113. [Boston Lying-in Hosp., Mass.] Spanish summary.

Nine infants who received no water for the first 3 days of life were compared with 9 who were given moderate amounts. The average weight loss during this time was 13 per cent. when water was withheld and 8 per cent. when it was given. The daily output of Na, K, Cl and N in the urine was unaffected by water intake. Infants of less than 36 weeks' gestational age excreted relatively larger amounts of electrolytes than mature infants. In 7 other babies who received glucose and water, the loss of weight was much less, indicating conservation of body water, but the expected Na-sparing and protein-sparing effects were not demonstrated. It is concluded that omission of water for 3 days after birth is permissible, but that if fluid is given it should be as glucose solution.

M. S. Fraser.

982

MONTAGNA, C. P. Ablactacion y alimentacion del niño en el segundo semestre. [Weaning and feeding the infant in the second month.] *Rev. Asoc. argent. Dietologia*, 1952, **10**, 170-187.

A lecture.

983

STEWART, A. and WESTROPP, C. Breast-feeding in the Oxford Child Health Survey. 2. Comparison of bottle- and breast-fed babies. *Brit. Med. J.*, 1953, **ii**, 305-308. [Social Med. Unit, Univ. Oxford.]

For Part 1 see Abst. 3400, Vol. 23.

Of the 580 babies studied, 142 were breast fed for less than 1 month, 84 were weaned from the breast in the second or third month, 119 in the fourth or fifth, and 235 were breast fed for 5 months or more. At the end of 12 months the first group were heavier than the last and had more teeth. There was no systematic difference between groups in skeletal maturity or patency of fontanelle. The percentages of babies crawling at 10 months and walking at 14 months were least in the last group. The overall infection rates of gastro-enteritis, bronchitis and otitis media between 2 and 12 months were not related to the duration of breast feeding. Gastro-enteritis was rare when babies were receiving breast milk only, reached a maximum at weaning, and was especially common among babies who began to be

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weaned in the sixth month. Head colds were almost equally common in breast- and bottle-fed babies.—F. C. Aitken.

984

GYLLENSWÄRD, C. **Breast-fed children compared to artificially fed children in a series from a Children's Home.** *Acta Soc. Med. upsalien.*, 1953, **58**, 285-311. [Paediat. Clin., Kronprinsessan Lovisas Barnsjukhus, Stockholm.]

The 142 children studied mostly entered the home at or before 2 weeks of age and stayed until 8 months; some stayed longer. Forty-nine were entirely or almost wholly breast fed for at least 6 months, 18 were entirely breast fed for 3 months and 75, most of whose mothers did not accompany them to the home, were almost entirely artificially fed. These groups were otherwise comparable. The children wholly or mainly breast fed gained weight better than the artificially fed throughout the period of observation, which extended beyond the introduction, as late as possible, of supplementary feeding. There was no difference between groups in the incidence of infections.—F. C. Aitken.

985

SIMPSON, A. S. **Breast versus artificial feeding: influence on weight gain.** *Med. Officer*, 1953, **90**, 85-87. [Ashton-under-Lyne, Lancs.]

The weight gains of 1382 infants born in a health division of Lancashire County Council during the year 1950 and the first half of 1951 were considered in relation to the duration of breast feeding.

Infants who were not breast fed or who received breast milk for less than 2 months were 9 to 10 oz. heavier at the end of the first year than those who were breast fed for longer than 2 months. Differences between the groups other than diet did not appear to be of importance in this study.

F. C. Aitken.

986

DROESE, W. and STOLLEY, H. **Vergleichende Untersuchungen über die Aufzucht von Säuglingen mit Kondensmilch und mit den bisher üblichen Milchemischungen. Zugleich ein Beitrag zur Frage des Kohlenhydratbedarfs der Säuglinge in der Klinik. [Comparison of infants reared on condensed milk and on the usual milk mixtures. The question of the carbohydrate requirement of infants in hospital.]** *Monatsschr. Kinderheilk.*, 1953, **101**, 285-292. [Kinderklin., Univ. Kiel.]

One hundred and eighty-eight infants, aged from 14 days to 10 months, recovering from acute or chronic nutritional disturbances, were fed on whole milk mixtures or unsweetened evaporated milk mixtures. The evaporated milk was tolerated as well as the usual whole milk mixtures,

except in the first 3 months of life, and altering the nature of the curd by adjusting the temperatures of homogenisation and sterilisation did not increase the digestibility of the evaporated milk. In all age groups susceptibility to fresh infections was significantly less in infants having evaporated milk mixtures. The question of there being special carbohydrate requirements with evaporated milk was studied, but the supplements necessary were similar to those for the usual milk mixtures. Requirement varied with the individual infant.

A. M. Copping.

987

TEZNER, O. **Nahrungseiweiss und Reststickstoff. [Diet protein and residual nitrogen.]** *Ann. paediat.*, 1953, **181**, 177-183. [Mothercraft Training Centre "Wizo", Tel Aviv.] English and French summaries.

Ten infants, of whom 9 were aged between 3 weeks and 2 months, 3 were premature, 1 mongoloid, 1 dystrophic and the others healthy, were given in successive weeks a half-milk diet based on dried milk of stated composition and supplying from 2.8 to 4.9 g. protein per kg. bodyweight daily, and a diet based on dried buttermilk, supplying from 5.2 to 11.1 g. protein per kg. bodyweight daily.

Some gained more on the second diet than on the first, others the reverse. After a week on the high-protein diet blood residual N was considerably raised in all but 1, and in 2 reached abnormally high values, 44 and 45 mg. per cent. One of these developed signs of toxicosis, e.g. loss of weight, pallor, apathy and loss of turgor, but recovered in a few days when treated with tea diet and then put on half-milk diet. All the others thrived on the buttermilk diet. Nevertheless, care in the use of high-protein diets is recommended lest toxicosis result. A brief discussion of the concept of toxicosis is appended.—W. M. Deans.

988

CAMACHO GAMBA, J. **La leche acida fermentada en la alimentacion infantil. [Acid fermented milk in infant feeding.]** *Rev. española Pediat.*, 1953, **9**, No. 50 Extraord., 437-452. [Univ. Nac. Colombia, Bogotá.] English, French and German summaries.

A review.

989

DEAN, R. F. A. **Plant proteins in child feeding.** *Med. Res. Counc. Spec. Rep. Ser.* No. 279, 1953, pp. viii + 163. H.M.S.O., London. Price 10s. net.

This report is in 2 parts. The first, in 49 pages, reviews the relevant literature on composition of breast milk, amino-acid requirements of children, evaluation of dietary proteins, need for milk

substitutes with an account of substitutes which have been used, and tests with laboratory animals and man of the value of supplementing plant proteins.

The second part describes in full feeding trials made during a study of undernutrition in Germany in 1946 to 1949. A short preliminary report has already been published (Abst. 819, Vol. 20). Cereal and soya bean mixtures with or without dried skimmed milk were compared with cow's milk as supplement to the diets of children in 2 orphanages and 2 schools. Cereal, soya bean and milk mixtures were tested also as substitutes for part of the cow's milk in the diet of young babies. Twenty-five newborn children, 25 aged from 6 to 12 months, 50 from 1 to 2 years, 50 from 2 to 6 years and 625 from 7 to 11 years took part in the trials, in which 3 combinations of barley, wheat and soya flours without milk, 4 with dried skimmed milk and 2 of barley, maize and soya flour with dried skimmed milk were tested for periods of between 8 and 24 weeks. Trypsin inhibitor was destroyed wholly or partly in all but one mixture. In the orphanages tests were conducted with comparable groups of children receiving the same basic diet, but the diets of the schoolchildren could not be controlled. The benefits of the supplements were assessed in terms of the ratio of actual to standard weight gain for each child. Two of the mixtures were discarded because they produced digestive upsets.

Faults in the manufacture of the mixtures and illness unconnected with the diets caused difficulties in interpreting the results. The most successful trial was with children between 1 and 2 years of age who grew well and who were in good clinical condition when given a cereal-soya mixture without milk for 16 weeks. The proportion of energy intake supplied by the mixture was between 40 and 50 per cent. Inclusion of 12½ per cent. dried skimmed milk conferred no additional benefit, but 25 per cent. caused greater progress. A supplement of cereal-soya mixture equivalent in energy to 500 g. fresh milk for children of 2 to 5 years and to 750 g. milk for children of 7 to 11 years gave good gains, but mixtures with 10 per cent. dried skimmed milk gave slightly better results. The results of removing trypsin inhibitor were inconclusive but seemed slightly favourable. Replacement of wheat by maize caused no obvious alteration in quality, and such a mixture with 10 per cent. dried skimmed milk was successfully given to newborn infants to supply 40 to 50 per cent. of total energy. The amino-acid content of the different mixtures was studied, but it did not account for differences in the effectiveness of different mixtures.

A special study was made of the energy intakes of children aged from 40 to 125 weeks and a rela-

tion was shown to exist between intake and weight for age.

Appendices to the report include some studies with trypsin inhibition *in vitro* and rat growth studies; the latter showed the benefit of adding dried skimmed milk to cereal-soya mixtures, the marked increase in growth rate produced by giving vitamin B₁₂ to rats on a cereal-soya ration and the benefit of removing trypsin inhibitor, which was nullified by bad manufacture of the mixture.—F. C. Aitken.

990

LAL, S. B. **The effect of pressed ground-nut cake flour in supplementing rice diet.** *Indian J. Med. Res.*, 1952, **40**, 471–479. [Pub. Health Lab., Patna 4.]

Boys in an Indian orphanage were divided into 3 groups of 17 or 18, of mean ages of 11·0, 10·3 and 9·0 years. The control group received a rice diet with vegetables; for the other groups this was supplemented with 1 oz. daily of pressed ground-nut cake flour or skimmed milk powder. Both supplements were beneficial in increasing height, weight and Hb value, the weight increase being somewhat greater with groundnut flour than with milk. The general health of the children was also improved by both supplements.—D. Duncan.

991

SELANDER, P. and SYRRIST, A. **The pacifier, its frequency and influence on the milk teeth.** *Acta paediat.*, 1953, **42**, 283. *Proc.*

992

DAVIDSON, W. D. **A brief history of infant feeding.** *J. Pediat.*, 1953, **43**, 74–87. [Dept. Paediat., Sch. Med., Duke Univ., Durham, N.C.]

993

WICKES, I. G. **A history of infant feeding. 3. Eighteenth and nineteenth century writers.** *Arch. Dis. Childhood*, 1953, **28**, 332–340. See also Title 4939, Vol. 23.

994

ZIEGLER, M. R. **Mineral-enriched meats for diets of infants requiring a milk substitute.** *J. Amer. Dietetic Assoc.*, 1953, **29**, 660–665. [Dept. Paediat., Univ. Minnesota, Minneapolis.]

A summary is given of the results of previous experiments (Abst. 4856, Vol. 17; McQuarrie and Ziegler, *Pediatrics*, 1950, **5**, 210), in which young rats were found to grow as well on a meat diet, provided Ca and P were added, as on a milk diet. On the basis of this work, a mineral-enriched meat diet was devised to replace cow's milk in the

feeding of infants or children for whom milk was contraindicated because of allergy or other disorder. Strained meats were used, with veal bone ash as main source of minerals; full details of composition and preparation are given. Satisfactory N, Ca and P retentions were found in 6 patients, and 2, one an infant with milk allergy and the other an infant with high blood galactose, are described in detail.—W. M. Deans.

995

SACKETT, W. W. (Jr.) **Results of three years experience with a new concept of baby feeding.** *Southern Med. J.*, 1953, **46**, 358-362 (with discussion 363). [Dept. Med. Res., Univ. Miami, Fla.]

It is reported that satisfactory results were obtained by starting babies with 6-hourly feeds from birth and by introducing cereals at 2 to 3 days of age, strained vegetables at 10 days, strained fruits at 17 days and varying the diet at weekly intervals. The midnight feed was abandoned as soon as possible and the regime changed to 3 meals a day. For mothers able to breast feed their infants this system was, in general, no more difficult than 4-hourly feeding, and most mothers who were willing to co-operate in the new method were enthusiastic about its results. The paper gives a general account of the method; details of 300 babies reared in this way are to be given later.—A. M. Copping.

996

ADAM, A. **Progresos en la alimentacion artificial del lactante sano y enfermo. [Advances in the artificial feeding of the healthy and sick infant.]** *Rev. española Pediat.*, 1953, **9**, No. 51, 471-504. [Clin. Paediat., Univ. Erlangen.] French, English and German summaries.

A review.

997

RICHMOND, J. B. and POLLOCK, G. H. **Psychologic aspects of infant feeding.** *J. Amer. Dietetic Assoc.*, 1953, **29**, 656-659. [Dept. Paediat., Univ. Illinois Coll. Med., Chicago.]

998

ANGELINI, B. and PENNATI, E. **Rilievi sull'accrescimento e sui problemi assistenziali del lattante distrofico. [The growth of the dystrophic infant and the problem of assistance.]** *Lattante*, 1953, **24**, 15-25. [Ist. Clin. Pediat., Univ. Milan.] English summary.

Of 1700 children treated for dystrophy in the Paediatric Clinic in 1946, 132 relapsed. Of the 132, 10 were lost sight of, and 38 died of some intercurrent complication, 23 of them within the first year of life. In 1951, therefore, 84 were

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surviving under observation. They belonged mostly to a low social level and lived in poor hygienic conditions. Originally all of them were 30 per cent. or more underweight. By the age of 5 or 6 years the development of a good number of the children was within the normal limits. It is concluded that many dystrophic children are inherently capable of making a good recovery but that many come from homes in which recovery is impossible. Further public assistance, even if it involves institutional life, is considered to be the only means of betterment for such children. A central institute for rehabilitation of dystrophic children is recommended, like the Paul Parquet Centre in Paris.—E. M. Hume.

999

SANTYAN Y VELASCO, S. **Studio statistico e considerazioni sui sistemi di allattamento nella provincia di Modena, in base ai dati dei Consultori dell' O.N.M.I. nel quinquennio 1947-51. [Statistical study and discussion on systems of breast feeding in the province of Modena, based on information from welfare clinics of the O.N.M.I. in the five years 1947-1951.]** *Lattante*, 1953, **24**, 3-9. [Clin. Pediat., Univ. Modena.] English summary.

The number of births in the province of Modena declined steadily in the years 1947 to 1951, but the number of infants brought to the clinics of the O.N.M.I. increased. The death rate in the first year of life in the province declined from 8.64 per cent. to 5.19 per cent.; among infants attending the clinics it was fairly constant at somewhere over 2, although the percentage breast fed (entirely breast fed for at least 5 months) among the infants attending the clinics declined from 52 to 41. It is considered that propaganda in favour of breast feeding should be continued and intensified.

E. M. Hume.

1000

PARENT, M. and MASSARDO-RAYMAEKERS. **Expérience d'alimentation complémentaire faite dans une consultation de nourrissons. [Supplementary feeding at an infant welfare centre.]** *Ann. Soc. belg. Méd. trop.*, 1953, **33**, 57-66. Flemish summary.

The mean age of the infants studied was 10 months; they were underweight and showed mild signs of kwashiorkor. The mothers received rations from their employer, but through ignorance the infants were weaned on to a predominantly carbohydrate diet. A daily supplement containing 11.5 g. arachis oil, 7.5 g. sugar, 4.5 g. maize flour and 25 g. dried skimmed milk was given to all the infants, of which one group was under observation for 22 months and another for from 7 to 17 months. The mean respective weight deficiency

from Schlesinger's norms for the 2 groups was before treatment 1.925 and 2.010 lb., and at the end 1.540 and 1.405 lb. A study of the growth curves, however, showed that the mean increase of weight from birth to the beginning of supplementary feeding was about 2.0 lb. below the expected gain, but during the period of supplementary feeding the gain exceeded the expected gain by 0.385 and 0.605 lb. for the 2 groups. At the end of the study the children appeared in excellent condition, though their physical development was that of their weight, not of their age. It is suggested that supplements given earlier would have allowed normal growth.—L. Wills.

1001

LE GROS CLARK, F. **The origins of school feeding : an international survey.** *Med. Officer*, 1953, **90**, 29-30.

1002

SOUTTO MAYOR, A. Alimentação do escolar. [**The feeding of schoolchildren.**] *Arq. brasil. Nutrição*, 1951, **8**, 465-501.

A review of requirements, of methods of education in nutrition and of diet improvement in schools.

See also Absts. 1003, 1295.

DIETARY SURVEYS AND INDIVIDUAL STUDIES

1003

BEAL, V. A. **Nutritional intake of children. 1. Calories, carbohydrate, fat and protein.** *J. Nutrition*, 1953, **50**, 223-234. [Child Res. Council, Denver, Colo.]

The data reported are based on the evaluation of 604 diet histories obtained on 46 children during the first 5 years of life. Quartile, maximum and minimum intakes referred to age and bodyweight are tabulated and graphed along with National Research Council recommended allowances. The findings are discussed.—F. C. Aitken.

1004

SPOLVERINI, L. Nel complesso della popolazione italiana quelli che mangiano peggio sono i bambini. [**Of the whole Italian population the worst fed are the children.**] *Riv. Clin. pediat.*, 1953, **51**, 569-578.

Children between 2 and 6 years old are considered the worst fed, their diet being composed largely of food made with white flour, and a little olive oil. The mothers' diets are considered to be deficient in pregnancy, and full lactation is impossible of achievement. The author pleads at length for better bread and *pasta* by restoration of the old dark flour, rather than by fortification of highly milled white flour.—E. M. Hume.

1005

LAMBERTS, J. H. Een onderzoek naar de sociale toestand, de voedingstoestand en het intelligentiequotiënt van Rotterdamse schoolkinderen in 1947, 1949 en 1951. [**Investigation into the social class, diet and intelligence quotient of Rotterdam schoolchildren in 1947, 1949 and 1951.**] *Tijdschr. soc. Geneesk.*, 1952, **30**, 347-364. [Rotterdam.]

In 1947, there were examined 444 children aged 6 to 9 years from 356 families and 4 schools in working-class areas; in 1949, 108 children from working-class families and in 1951, 156 children from the highest, intermediate and lowest school classes.

The social survey included information on place of birth, employment, education and details of house and household equipment and management. I.Q. was estimated by the method of Terman and Merrill. Clinical data collected were height and weight, the Van der Heyden and *sacratama* indexes, presence of signs of deficiency, blood pressure and pulse rate, Hb, red cell count, and blood total protein, globulin, cholesterol, Ca, inorganic P, vitamin A, carotenoids and vitamin C.

Many correlations have been measured. For instance, children that slept alone had a significantly higher mean I.Q. than those that slept two or more in one bed. Children with better sleeping quarters were taller and heavier and had higher blood Ca than those with poor quarters. I.Q. rose as mean size of family fell and as social status improved, but there was no significant change in blood chemistry with social class. Boys of the upper classes were heavier and taller than those of the working class, but differences were less and not significant for girls. Hb was lowest in the poorer workers' children but was low in all. For further comments on measurements and clinical data see Abst. 2760, Vol. 22.

Thyroids were obviously enlarged in 12 per cent. of the children.

The general conclusion is drawn that the children of working-class families lack milk and overcompensate with fruit in their diet. They require supplementary feeding in school.

I. Leitch.

1006

SWANSON, P. **Food intake of individuals.** *Proc. Nat. Food Nutrit. Inst.*, December 1952; *U.S. Dept. Agric., Agric. Handbook* No. 56, 41-51. [Iowa Agric. Exp. Stat.]

1007

CUVELIER, B. V. J. (with VERDONK, G.) Enkele beschouwingen over de voeding van de Belgische bevolking. [**Some views on the diet of the Belgian people.**] *Voeding*, 1953, **14**, 320-337. [Biochem. Centrum, Rijks Univ., Ghent.]

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The diet of the Belgian people is discussed in terms of the daily consumption per head of 14 foods, including beer and coffee, from data given by the Ministry of Economic Affairs for the years 1948 to 1951. In quantity, potatoes head the list with 400 g., beer follows with 360 and milk with 274 g. The others listed are in g.: bread 322, sugar 60, pig meat 49.5, beef 45.3, egg 33.6, butter 29, margarine 21.3, coffee 15.7, cheese 15.4, horse-flesh 9.3 and frozen beef 4.4. Beef and butter took the highest percentages of cost. Costs are outlined in detail. Quality of the diet is represented by a series of diagrams in which total intakes of 10 components are compared with requirements [standard not stated] and the amounts supplied by each "food" are shown. Only P, Fe and "Vitamine PP" are in excess of needs. Protein is about 82.5 per cent. of needs and half of it is of animal origin. Amino acid supplies are, on the average, adequate, with cystine in poorest supply.—I. Leitch.

1008

KARVONEN, M. J. La diététique des travailleurs de force. [The feeding of heavy workers.] *Gaz. méd. France*, 1953, **60**, 35–36. [Inst. Méd. Travail, Helsinki.]

The interactions of hard work and digestion are discussed and some preliminary details are given of the food habits of the champion lumberjacks of Finland in 1951. They drank milk in large quantities, as much as 2½ litres daily. For breakfast they liked porridge, 100 to 350 g., with sugar and a lot of butter, 25 to 50 g. They had a light mid-day meal and a large meal after work was over for the day. This is contrary to the Finnish tradition of 3 substantial meals a day, and it is suggested that other workers, both outdoor and indoor, might modify their habits with advantage.—W. M. Deans.

1009

DEJEAN, CARRÈRE, P., TRÉMOLIÈRES, J., POMMEAU, Y., CHABERT, DE GASQUET and BERNET. Étude sur l'alimentation et les dépenses familiales en milieu artisanal à Marseille en 1952. [Study on diet and family expenditure among tradesmen in Marseilles in 1952.] *Bull. Inst. nat. Hyg., Paris*, 1953, **8**, 449–487.

A study was made in Marseilles in the summer of 1952, by methods previously used, of representative families of tradesmen working on their own account, with or without journeymen or apprentices; some were selling goods made elsewhere, others not. The contrasting trades selected were plumbing (prosperous, 56 families with 207 persons) and shoemaking (precarious, 57 families with 186 persons). Sixty-two per cent. of the

plumbers were of French origin, but only 17 per cent. of the shoemakers.

On the whole, suitable amounts of butter, fruit and vegetables were consumed. Meat consumption was adequate but not excessive. Large quantities of cereals were used, but not very much bread; no dried vegetables. Mean energy and nutrient consumptions were satisfactory; fat and vitamin A were more than adequate. There were, however, unusually great variations between families, e.g., meat consumption ranged from 18 to 270 g. per head daily and milk from zero to over ½ litre. Plumbers' families with children had a low Ca intake and shoemakers' families with children had also a low intake of animal protein. Plumbers' families with children fared better than dockers' families (Abst. 2703, Vol. 22) or large families in general (Abst. 4918, Vol. 23).

Menus were simple. The principal meal was at mid-day; the evening meal always included soup, often other items left over from mid-day, but rarely meat. Fish dishes and fish soup (bouillabaisse) were frequent.

Daily food expenditures per head were: plumbers without children 345, with children 288; shoemakers without children 250, with children 264 fr. Food expenditure formed, respectively, 59, 55.7, 58.3, 60.1 per cent. of total expenditure. In plumbers' families 31.5 per cent. of food expenditure went on meat, fish and eggs, in shoemakers' families 27 per cent. Seventy-five per cent. of the plumbers' wives and 47 per cent. of the shoemakers' wives considered their families were adequately fed; those who did not mostly blamed lack of money. Although on the average consumption of meat was adequate (101 g. for the 2 groups taken together), 30 per cent. would have liked more; next came fruit and fish.

About 1/3 of the women in each group had work other than home duties, the plumbers' wives usually in the shop, the shoemakers' wives outside the home and business. The effect was that both groups spent more on food and the diet of the shoemakers' families was distinctly improved; that of the plumbers' families was already adequate.—W. M. Deans.

1010

DEN HARTOG, C. De voeding van de Nederlandse haringvisser op een haringdrijfnet-schip. [Diet of Netherlands herring fishers on a drifter.] *Voeding*, 1953, **14**, 337–341.

The regulations for the diet of seamen in the herring fishing industry are discussed. The amounts of foods usually provided are listed and their value in nutrients, with certain alternatives e.g., fresh or pickled vegetables, is computed. The probable composition of the diet is about: Cal.

3700, protein 100 g., fat 200 to 240 g., carbohydrate 300 to 400 g., Ca 0.84 to 1.0 g., Fe 13 to 20 mg. and vitamins, A 2400 I.U., carotene 100 to 2375 μ g., B₁ 1570 to 2260 μ g., riboflavin 1380 to 1870 μ g., nicotinic acid 10 to 18 mg. and, so long as potatoes are adequate for the trip, vitamin C about 100 mg., but temporarily as low as 3 mg. if potatoes are finished and there are only pickled vegetables.—I. Leitch.

1011

SARKAR, A. K. and SARKAR, N. **Dietary survey of a nurses' hostel in West Bengal.** *J. Indian Med. Assoc.*, 1953, **22**, 415-418. [Nurses' Hostel, Fraser Hosp., Burdwan, W. Bengal.]

The food of 165 nurses was weighed raw for one year and the average nutritive value of the diet was calculated. Intakes of nutrients fell somewhat short of the amounts which would be obtained from the diet prescribed by the authorities and fell substantially short of average requirements of nutrients, excepting Fe and nicotinic acid. The requirements were based on Indian and American recommended allowances. Suggestions are made for improvement of the diet.—F. C. Aitken.

See also Abst. 1425.

GENERAL STUDIES: DIET PLANNING: EDUCATION

1012

HOGAN, A. G. **Nutrition.** *Annu. Rev. Biochem.*, 1953, **22**, 299-318. [Dept. Agric. Chem., Univ. Missouri, Columbia.]

1013

CUTHBERTSON, D. P. **Nutrition.** *Annu. Rev. Med.*, 1953, **4**, 135-162. [Rowett Res. Inst., Bucksburn, Aberdeenshire.]

1014

SEBRELL, W. H. (Jr.) **Nutrition—past and future.** *Proc. Nat. Food Nutrit. Inst.*, December 1952; *U.S. Dept. Agric., Agric. Handbook* No. 56, 3-12. [Nat. Inst. Health, Pub. Health Serv., Fed. Sec. Agency.]

1015

KING, C. G. **Significances of recent advances in nutrition research.** *Proc. Nat. Food Nutrit. Inst.*, December 1952; *U.S. Dept. Agric., Agric. Handbook* No. 56, 13-18. [Nutrit. Found., Inc.]

1016

PHIPARD, E. F. **Dietary adequacy of family food supplies.** *Proc. Nat. Food Nutrit. Inst.*, December 1952; *U.S. Dept. Agric., Agric. Handbook* No. 56, 30-40. [Family Econ. Div., Bur. Human Nutrit., U.S. Dept. Agric.]

1017

WILDER, R. M. **Nutritional health of adults.** *Proc. Nat. Food Nutrit. Inst.*, December 1952; *U.S. Dept. Agric., Agric. Handbook* No. 56, 52-58. [Nat. Inst. Arthritis and Metabol. Dis., Pub. Health Serv., Fed. Sec. Agency.]

1018

STEARNS, G. **Nutritional health of infants, children, and adolescents.** *Proc. Nat. Food Nutrit. Inst.*, December 1952; *U.S. Dept. Agric., Agric. Handbook* No. 56, 59-63. [Dept. Paediat., Univ. Iowa.]

1019

HEUPKE, W. and FISCHER, H. **Ernährung und Diät. [Nutrition and diet.]** *Münch. med. Wochenschr.*, 1953, **95**, 660-662. [Hosp. z. Heiligen Geist, Frankfurt a.M.]

A review.

1020

MOLCHANOVA, O. P. **[Some stages in the development of the science of nutrition during the last 35 years.]** *Sovet. Med.*, 1952, **16**, No. 10, 3.

1021

SEBRELL, W. H. (Jr.) **Enrichment. A public health approach to better nutrition.** *Pub. Health Rep., Washington*, 1953, **68**, 741-746. [Nat. Inst. Health, Pub. Health Serv., Washington, D.C.]

1022

DOLS, M. J. L. and DEN HARTOG, C. **Menu's aangepast aan de gemiddelde behoefte aan voedingsstoffen. [Menus planned to meet mean requirements of nutrients.]** *Voeding*, 1953, **14**, 368-380.

Since the last menus planned to meet human needs were published in 1950 (Abst. 2565, Vol. 20), the Commissie Voeding en Landbouwpolitiek has revised its scale of requirements and the scale is set out anew. There follow: requirements of the main foods or groups of foods for children, 0 to 1 and by 3-year groups to 19, sexes separately from 13, and for men and women separately, distinguishing 3 grades of work, pregnant and lactating women (taken as having the same requirements) and men and women 60 years old or more, and finally, menus to supply the stated needs for each group.—I. Leitch.

1023

RODRIGUEZ-MIÑON, J. L. **Valor nutritivo de los platos más comunes de la cocina española. [Nutritive value of the most common dishes in the Spanish cuisine.]** *Rev. española Enferm. Apar. digest. Nutricion*, 1953, **12**, 276-286.

N.A. and R., January 1954

[Inst. Invest. Med., Madrid.] English summary.

This assessment of the nutritive value of the commonest dishes in the Spanish cuisine includes the quantities of the raw ingredients used in preparing the dishes, the protein, fat and carbohydrate contents and the energy value of the cooked product, and the amounts of these in a helping of average size.—M. B. Richards.

1024

MINISTERIO DE SANIDAD Y ASISTENCIA SOCIAL, CARACAS. Programa de nutrición para los centros de salud publica. "Plan mínimo." Manual de procedimientos. [Nutrition programme for public health centres. "Plan mínimo." Instruction manual.] *Inst. Nac. Nutric., Caracas, Venezuela*, April 1953, pp. 59.

The classification of families in 3 economic groups is described on the basis of information collected by health visitors. They are the educable, where better use of income is needed, the educable-assistance, where both types of help are required, and the assistance, where little can be done without financial aid. The second part of the manual deals with the training which the health visitor herself must undergo.

M. B. Richards.

1025

DONATH, W. F., FISCHER, I. A., VAN DER MEULEN-VAN EYSBERGEN, H. C., and DE WIJN, J. F. Voorlopige mededelingen omtrent een onderzoek naar het resultaat van voeding zonder dierlijke eiwitten. [Preliminary report on the investigation into the effect of diet without animal protein.] *Nederland. Tijdschr. Geneesk.*, 1953, **97**, 2118–2122. [Nederlands Inst. Praev. Geneesk., Leyden.] English summary.

This is a rewrite from a more clinical point of view of data already presented and described in *Abst.* 4919, Vol. 23.—I. Leitch.

1026

Lectures on prenatal care. *Nederl. Bond Moederschapszorg., The Hague*, 1953, pp. 64.

These collected lectures are published by the Netherlands Association for Maternal Care and Child Health. They were delivered to medical practitioners in Leyden and Rotterdam and first published in *Tijdschr. Soc. Geneesk.*, 1953, **31**, Nos. 11 and 12. There is a foreword by the Minister of Public Health in which he quotes from Dr. Posthuma's review of infant mortality that one out of 30 pregnancies ends prematurely and perinatal (obstetric) deaths number 4 times all deaths from tuberculosis.

The lectures are propaganda, and a basis for

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improved prenatal care. The introductory statement of the problem is by de Haas, that on obstetrical care by Schmidt. Three lectures are devoted to nutrition: a general one on diet and health by Roovers, a short review of experimental studies of diet in pregnancy by den Hartog and one on feeding the family, the pregnant woman and on the family budget by Van Schaik. There is also one on social aspects of prenatal care by Remmelts, two on mental hygiene by Van der Spek and Van Kooten, and finally a review by Posthuma of perinatal mortality in the Netherlands and elsewhere from 1926 to 1950, a most useful review. Altogether, it is a clear and fair, if not critical, statement of presently accepted views that should be helpful to all occupied in the work of maternal clinics.—I. Leitch.

1027

OLAYA R., J. La educación higienica y la nutrición escolar. [Health education and nutrition of the schoolchild.] *Bol. Ofic. sanit. panamer.*, 1953, **34**, 326–330. [Serv. Coop. Interamericano Salud Púb., Colombia.] English summary.

In Colombia the programme for health education and improvement of nutrition in schoolchildren was hampered by lack of suitable teachers at advanced levels. The plans were modified to give, to the children at school and to their parents, simple instructions on the basic principles of health and nutrition, with demonstrations of a balanced diet in the school canteen. The participation of the whole community in the financing and running of nutrition-education projects was a means of making the importance of nutrition widely appreciated. The success of a co-operative nutrition education programme combined with a school meals service in the department of Valle del Cauca is reported, and it is suggested that similar programmes could be built up in other areas.—A. M. Copping.

1028

MOORJANI, M. N. and SUBRAHMANYAN, V. The poor South Indian rice diet and its nutritional improvement. *Bull. Central Food Technol. Res. Inst., Mysore*, 1953, **2**, 185–188. [Central Food Technol. Res. Inst., Mysore.]

1029

HALE, E. M. The education of the schoolchild in nutrition. *Proc. Nutrit. Soc.*, 1953, **12**, 166–169. [Minist. Educat., Curzon St., London, W.1.]

1030

HOUSE, E. R. The education of housecraft teachers in nutrition (England and Wales).

- Proc. Nutrit. Soc.*, 1953, **12**, 170-173. [Minist. Educat., Curzon St., London, W. 1.]
- 1031
COWELL, S. J. **The education of medical students in nutrition.** *Proc. Nutrit. Soc.*, 1953, **12**, 173-176. [University Coll. Hosp. Med. Sch., London, W.C.1.]
- 1032
COPPING, A. M. **The new degree in nutrition.** *Proc. Nutrit. Soc.*, 1953, **12**, 177-178. [Dept. Physiol., Queen Elizabeth Coll., London, W.8.]
- 1033
LEBEN, F. S. **Nutritional education in the army.** *Proc. Nutrit. Soc.*, 1953, **12**, 181-186. [War Office, London, S.W.1.]
- 1034
LUMBY, A. **The place of nutrition in the Institutional Management Association certificate course.** *Proc. Nutrit. Soc.*, 1953, **12**, 186-188. [Institutional Management Assoc., 324 Gray's Inn Rd., London, W.C.2.]
- 1035
FULLER, J. **Nutrition teaching in the courses sponsored by the Hotel and Catering Institute.** *Proc. Nutrit. Soc.*, 1953, **12**, 189-193. [Hotel and Catering Inst., 24 Portman Sq., London, W.1.]
- 1036
MAGEE, H. E. **The Royal Sanitary Institute certificate in nutrition.** *Proc. Nutrit. Soc.*, 1953, **12**, 193-195. [Minist. Health, 23 Savile Row, London, W.1.]
- 1037
YUDKIN, J. **The teaching of nutrition: a summary.** *Proc. Nutrit. Soc.*, 1953, **12**, 198-199. [Queen Elizabeth Coll., London, W.8.]
- 1038
VAN SCHAICK, F. S. M. **Visuele hulpmiddelen bij voordrachten en lessen over voedingsleer. [Visual aids for lectures and lessons on nutrition.]** *Voeding*, 1953, **14**, 407-409. [Voortlichtingsbureau, Voedingsraad, The Hague.]
- 1039
GASTINEAU, C. F. **Stress and nutrition.** *J. Amer. Dietetic Assoc.*, 1953, **29**, 666-669. [Div. Med., Mayo Clin., Rochester, Minn.]
- 1040
MITCHELL, M. L. **Stress factors and nutrition.** *J. Amer. Dietetic Assoc.*, 1953, **29**, 753-757. [Inst. Med., Univ. Montreal.]
- 1041
MILLAR, W. M. **Psychiatric implications of disturbances of eating and nutrition.** *Proc. Nutrit. Soc.*, 1953, **12**, 144-148. [Dept. Mental Health, Univ. Aberdeen.]

FOOD ECONOMICS AND STATISTICS

- 1042
SCHULZ, T. **A 'human needs' diet: April, 1953.** *Bull. Inst. Statistics Oxford*, 1953, **15**, 249-254.
The cost of a "human needs" diet for a family of 5 in April 1953 was 65s. 3d., i.e., 1s. 7½d. more than in November 1952 (Abst. 2161, Vol. 23).
In previous papers the amount of Ca supplied daily by the diet was given as 0.6 g. instead of 0.7 g. owing to an erroneous assumption about the Ca content of national bread and flour.
W. M. Deans.

- 1043
FERGUSON, T. and LOGAN, J. C. **Mothers employed out of the home.** *Glasgow Med. J.*, 1953, **34**, 221-244. [Dept. Pub. Health, Univ. Glasgow.]
In 1951 and early 1952 a study was made in Glasgow of 350 married women who were employed outside the home and of 350 who were not; all had infants aged about 7 months and the 2 groups were closely matched for socio-economic background, though not for size of family.

In general, work outside the home tended to have an adverse effect on reproductive performance and family health. Breast feeding was commoner and lasted longer in mothers not working outside the home. Fourteen per cent. of those in factories breast fed for at least 12 weeks; 25 per cent. of those in shops and 24 per cent. of those in domestic work, but many of both these categories were working only part time. Babies breast fed for at least 12 weeks had less illness than others. Of the school-age children of mothers in jobs, barely half were having school meals.

Over 60 per cent. of the mothers in jobs declared they had to work in order to make ends meet, and this was borne out by a study of the money available for housekeeping, including rent. Nevertheless, mothers in jobs did not spend more on food; they had more club and hire-purchase commitments, and there was evidence that fathers' contributions to housekeeping money were

less where mothers were earning, though whether this was cause or effect was not clear.

The social implications are discussed.

W. M. Deans.

1044

CLARK, C. **Population growth and living standards.** *Internat. Labour Rev.*, 1953, 68, 99-117.

Many Malthusians disclaim anti-religious preconceptions and claim to be purely scientific in outlook. "If that is so, there cannot be any other group of scientists so ill informed on the facts with which they are supposed to deal. Many Malthusians have no knowledge of the simplest facts about population; and those who do know some demography seem to be almost universally uninformed on economics."

The law of increasing returns which commonly applies in industry, i.e., where increase of output results in increasing returns per unit of labour or other economic resources employed, is little known and less regarded in discussions of population and resources. Very few areas of the world are overpopulated in relation to resources. In agriculture, with Denmark as standard, enormous increases in population and production are possible. "The world's total area of cultivable land (allowing for double cropping in the highest rainfall tropical areas) is 24 million square miles, and at Danish standards of cultivation and consumption could support 12,000 million people, as opposed to the 2300 million people it supports now."

The fertility of the human race is usually overestimated and the effect on it of apparently small changes, such as deferment of marriage by only a year or two, as has been happening in India, is not appreciated. The rise in production in India since 1870 has been far greater than the rise in population (often regarded as one of the major problems) and there is every prospect that it will so continue.

Speed of development depends on capital accumulation, and extension of agricultural production often requires capital investment comparable with that in developing manufacturing industries. The conditions necessary to growing prosperity are: for the few isolated overcrowded areas, freedom to emigrate; open markets for the goods from poor but expanding countries, and capital help for those least well endowed.

I. Leitch.

1045

SCHRADER, F. M. and WOOLLAM, G. E. **Seasonal variation in prices and production of livestock and livestock products.** *Canada Dept. Agric., Marketing Serv., Econ. Div., Ottawa*, April 1953, pp. 2, 33 Charts.

The livestock and products dealt with include beef animals, certain beef cuts, pigs, pork and bacon, veal, lamb, milk, butter, eggs and chickens.

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Twenty charts and one table based on data referring to the period from 1933 to 1950, but excluding the war years when prices were controlled, show the seasonal variations in prices and production. Where trends were found 13 additional charts were prepared showing the changes in these during the period 1921 to 1950.—D. Harvey.

1046

WOOLLAM, G. E. **The influence of prices on the relative consumption of beef and pork.** *Canada Dept. Agric., Marketing Serv., Econ. Div., Ottawa*, June 1953, pp. 9.

On the assumption that wholesale prices reflect consumer demand, the annual domestic consumption of beef and pork in Canada and the prices of these on the Toronto market were analysed for the period 1927 to 1950. It was apparent that when the price of beef was high relative to that of pork, the consumption of beef was relatively low. About 90 per cent. of the variation in consumption of beef expressed as a percentage of consumption of pork was associated with variation in the price of beef expressed as a percentage of the price of pork. The average relation between relative prices and consumption during the period was such that a 1 per cent. change in the price of beef relative to that of pork resulted in a 1 per cent. change in the opposite direction in the consumption of beef relative to that of pork.

A technical appendix gives details of the statistical methods used.—D. Harvey.

1047

BANNA, A., ARMORE, S. J. and FOOTE, R. J. **Peanuts and their uses for food.** *U.S. Dept. Agric. Marketing Res. Rep. No. 16*, 1952, pp. 99. [Bur. Agric. Econ., Washington, D.C.]

About a third of this report consists of statistics on groundnuts (peanuts) in the U.S. for the last 30 or 40 years: production, prices, marketing regulations, imports, exports and uses in the home market. The fluctuations and trends are discussed in detail with the aid of further tables and 6 graphs.

Five of the southern states produce most of the crop, Georgia leading with 34 per cent. Production has risen steadily since 1909 and rapidly during the two world wars to a record of 2336 million lb. picked and threshed in 1948, with a slight subsequent decline. In addition, some are cut as hay or used as pasture for pigs. Imports almost disappeared after 1929 and have been forbidden since 1943. Exports were considerable during the immediate post-war years but are now small.

Domestic consumption has increased with production. For the years 1937-41 the total average

domestic consumption was 944 million lb. on a kernel basis, divided as follows: edible uses 609, crushing for oil 203, seed 114, feed for livestock 18 million lb. In 1950-51 consumption per head in edible uses was about 4.4 lb. (kernel basis), compared with 6.5 lb. in 1945-46, when competing foods were scarce and money plentiful, and 2.4 lb. in 1909-13. Peanuts roasted in shell now account for only 8 per cent. of the total edible use; consumption in this form is greater among the lower-income groups and in the South. Expenditure on shelled peanuts rises sharply with income, that on peanut butter less sharply. Of the shelled

peanuts about half are used to make peanut butter, the other half being about equally divided between candy and salted peanuts. Popcorn is believed to be a major competitor of salted peanuts. Peanut butter has to compete with jam, cheese and other sandwich fillings, for which prices are also quoted.—W. M. Deans.

1048

CAMACHO M., L. H. and RAMÍREZ C., M. El mercado del frijol en Palmira. [The market for French beans in Palmira.] *Acta agronom.*, Colombia, 1953, 3, 163-175.

DIET IN ETIOLOGY OF DISEASE

METHODS OF ASSESSING STATE OF HEALTH

1049

GOVIL, K. K. Clinical assessment of nutritional status of school boys in Uttar Pradesh. *Indian Med. Gaz.*, 1952, 87, 567-573. [Provincial Hyg. Inst., Lucknow.]

The methods prescribed by the Indian Council of Medical Research (1948) were used for examining 6371 boys, of whom 90 per cent. were from rural and 10 per cent. from urban districts. Ages ranged from 5 to 16 years and from measurements of weight, height and intercrystal diameter, mean values for which are given, growth was shown to be greatest between 13 and 15 years. Classification of physique by appearance resulted in 3.7, 55.7, 37.2 and 3.3 per cent. being described as good, fair, poor and very poor, respectively. Of the total number 59.3 per cent. were affected by one or more of the deficiency conditions, and the percentages of them in the groups ranged from 28.8 in the good to 82.1 in the very poor.

The incidence of deficiency signs is tabulated in detail. Those of vitamin A were common and those of other vitamins less frequent, the incidence increasing, as expected, in the groups with the poorer physique. Of the boys 81.7 per cent. had no dental caries.—D. Harvey.

1050

SQUIRES, B. T. Tongue patterns of African children in health and in malnutrition. *Trans. Roy. Soc. Trop. Med. Hyg.*, 1953, 47, 329-333. [Med. Serv., Bechuanaland Protectorate.]

Permanent records of tongue patterns were prepared by DiPalma's method with an ink prepared from T 1824 dye (*Arch. Int. Med.*, 1946, 78, 405). Counts made of filiform and fungiform papillae in unit areas of the tongues of 400 apparently healthy children showed a ratio 4.5:1. Similar prints were prepared also for another group of 458 children. For 402 of them clinical exam-

ination showed no malnutrition and 381, 95 per cent. of these, had normal tongues. Of 56 in whom malnutrition was noted, 54 had abnormal tongues. Disappearance of filiform papillae caused the ratio of these to fungiform papillae to fall to 2:1 or less.

Such tongue prints are considered to be useful as permanent records of nutritional disease.

D. Harvey.

1051

SQUIRES, B. T. The ultra-violet fluorescence of the tongue in African children. *S. African Med. J.*, 1953, 27, 759-760. [Med. Serv., Bechuanaland Protectorate.]

Fluorescence was absent from a much higher proportion, 51 and 40 per cent., respectively, of the 873 African and 44 European children examined than that of 11 per cent. reported by Tomaszewski (*Brit. Med. J.*, 1951, i, 117) for his subjects under 20 years of age. Hagerman and Hirschfield (*Acta dermato-venereol.*, 1947, 27, 369) have shown that fluorescence increased in certain subjects given vitamin B complex, but the changes noted in 87 of these Tswana children when they returned to a poorer diet after a period of better feeding were not significant. A smaller group of 38 African children with well marked signs of malnutrition did show no or only faint fluorescence.

D. Harvey.

GENERAL STUDIES

1052

DAVIES, J. N. P. Nutrition and nutritional diseases. *Annu. Rev. Med.*, 1952, 3, 99-132. [Dept. Pathol., Med. Sch., Makerere Coll., Kampala, Uganda.]

1053

ANDERSON, R. J. Nutritional aspects of chronic disease. *Proc. Nat. Food Nutrit. Inst.*, December 1952; *U.S. Dept. Agric., Agric.*

N.A. and R., January 1954

Handbook No. 56, 80-85. [Div. Chronic Dis., Bur. State Serv., Pub. Health Serv., Fed. Sec. Agency.]

1054

GÓMEZ, F. Problemas social y medico de la desnutricion. [**Social and medical problems of malnutrition.**] *Rev. española Pediat.*, 1953, 9, No. 50 Extraord., 165-179. [Mexico.] French, English and German summaries.

A general review.

1055

AMIES, C. R., LOEWENTHAL, L. J. A., MURRAY, N. L. and SCOTT, J. G. **Blindness in the Bantu. A survey of external eye disease and malnutrition in the North Eastern Transvaal.** *S. African Med. J.*, 1953, 27, 593-597. [S. African Inst. Med. Res., Johannesburg.]

People numbering 259 and 253, belonging to the Bavenda and Shangaan tribes of north-eastern Transvaal, were examined for eye diseases and signs of malnutrition. The incidence of trachoma among Shangaan was more than 7 times that among Bavenda, 48 and 6.5 per cent., a result attributed to the more insanitary conditions and greater number of flies found among the Shangaan. In this and an earlier survey (Amies *et al.*, *S. African Med. J.*, 1952, 26, 362) blindness from leucoma was common. Assessment was made of the nutritional state of the population from the number of occurrences of 8 signs, mainly in the skin, which were considered to have nutritional significance. The index for these, *i.e.*, the frequency per head of population for all signs together, was greater for the Bavenda, 0.69, than for the Shangaan, 0.53.

The evidence makes untenable the view that the high incidence of blindness among Bantu is due largely to malnutrition.—D. Harvey.

1056

MANSON-BAHR, P. **The causation of tropical sprue. A hypothesis.** *Lancet*, 1953, 265, 389-391. [Hosp. Trop. Dis., London.]

It is suggested that tropical sprue is primarily a virus infection of the intestinal tract and secondarily a nutritional disturbance due to changes in intestinal flora and interference with absorption.

F. C. Aitken.

1057

SCHORNAGEL, H. E. **The connection between nutrition and mortality from coronary sclerosis during and after World War II.** *Doc. Med. geograph. trop.*, 1953, 5, 173-183. [Lab. Pathol. Anat., Municip. Hosps., Rotterdam.]

An analysis of the post-mortem findings for the period 1940 to 1950 showed a marked drop in mortality from coronary sclerosis and thrombosis

during the war and a rapid increase to pre-war levels immediately after it. The number of thromboses increased absolutely and relatively from 1945 to 1950. From these findings and from a study of the literature it is concluded that the increase in mortality after the war was due to the increased intake of fat and the more liberal nature of the diet, and that severe restriction of food, particularly of lipids, might have a favourable influence on the incidence of cardiac infarction.

L. Wills.

1058

HIGGINSON, J., GERRITSEN, T. and WALKER, A. R. P. **Siderosis in the Bantu of Southern Africa.** *Amer. J. Pathol.*, 1953, 29, 779-815. [Baragwanath Non-European Hosp.]

Tissues from 44 post-mortem examinations were examined microscopically and the Fe content was estimated in selected organs from 21 of them. The findings at 252 other examinations were reviewed and the livers from these were sectioned and stained for Fe; 110 biopsy specimens of liver were also examined. Liver blocks from 72 Bantu in other territories were available for comparison. Detailed descriptions of macroscopical and microscopical appearances are given. Two cases of haemochromatosis in Europeans were similarly investigated.

Siderosis in the Bantu both from its frequency of occurrence and from its distribution in the liver and reticulo-endothelial system is considered to differ fundamentally from haemochromatosis, in which the Fe storage is believed to be mainly parenchymal. The ingestion of abnormally large amounts of Fe (see Abst. 4125, Vol. 20) as possible cause is suggested for further investigation.

D. Harvey.

1059

VILLA, L. **L'impostazione biochimica dell'alimentazione nelle malattie del fegato. [Biochemistry of nutrition and diseases of the liver.]** *Quad. Nutrizione*, 1952, 12, 9-40 (with discussion 41-59). *Proc. [Ist. Clin. Med. Gen., Univ. Milan.]*

See also Abst. 393.

DEFICIENCY DISEASES

General

1060

JELLIFFE, D. B. and ONWUMERE, R. E. **Malarial chemoprophylaxis and weight gain in West African infants.** *J. Trop. Med. Hyg.*, 1953, 56, 187-189. [Dept. Med., Univ. Coll., Ibadan, Nigeria.]

A small-scale trial with 26 Yoruba infants aged from 7 to 10 months and treated for a time with proguanil suggested that malaria is not the main cause of poor growth in African infants. More extended studies are called for.—W. M. Deans.

1061

FRIEDMAN, A. **Experiences in two hundred eighty-nine cases of infantile diarrhea in a nutritionally deficient group of infants.** *Amer. J. Dis. Child.*, 1953, **85**, 675-687. [Dept. Paediat., Rambam Govt. Hosp., Haifa, Israel.]

The children studied were mostly those of new immigrants into Israel in 1950 and 1951, 85 per cent. of whom had come from Moslem countries. Only those under 2 years of age and suffering from diarrhoea with severe dehydration were considered. Examinations of specimens of blood and stools were made in addition to clinical examinations. In the protozoa and bacteria isolated, pathogenicity was confirmed only for *Shigella* and *Salmonella* infections. Of the 289 children 53 per cent. had parenteral infection, the commonest being acute pharyngitis and bronchopneumonia. Nearly all were underweight, half suffered from frank malnutrition, 40 per cent. were anaemic and 30 per cent. rachitic. Frequency diagrams are given for values of serum albumin and globulin, Hb and red cell counts and Ca, P and acid phosphatase in serum.

Intravenous therapy only was given for 8 to 12 hr., after which oral feeds of buttermilk, half milk, skimmed or protein milk were also given. Buttermilk gave the best results. Sulphonamide preparations were the principal antibacterial substances used.

The highest incidence was in the 4th month of life and in spite of hospital treatment 58 of the children died. The relatively low incidence among younger babies is attributed to the serious attempts at breast feeding made by nearly all mothers of Middle Eastern origin.—M. S. Fraser.

1062

BANSI, H. W. **Somatische Spät- und Dauer-schädigungen nach Dystrophie. [Late and permanent body damage from dystrophy.]** *Deutsch. med. Wochenschr.*, 1953, **78**, 1318-1321. [I. Med. Abt., Allg. Krankenhaus St. Georg., Hamburg.]

In this lecture delivered to a psychiatrists' society, the question of disabilities in ex-prisoners-of-war which may be the late results of starvation are discussed. These are considered under the headings of heart and circulation, gastro-intestinal tract, liver, skeletal system and complicating infections, e.g., tuberculosis. Many symptoms and complaints must be regarded as of psychic origin, and not the direct result of dystrophy. The liver, being the organ most endangered by dystrophy, must be taken into account as a possible seat of late injury. Osteoporosis may gradually develop from loss of Ca due to the diarrhoea frequent in hunger oedema. The manifestations of tuberculosis during imprisonment and also the later

appearance of a new infection may be considered to be results of starvation. An unsatisfactory aspect is that of the great number of subjective disorders among returned prisoners.

M. B. Richards.

1063

MOGILNICKI, R. **The advanced malnutrition of forced labour camps.** *J. Trop. Med. Hyg.*, 1953, **56**, 159-162.

Incarceration in the hospital of a forced-labour camp north of the Arctic Circle in the U.S.S.R. in 1940-41 gave the author the opportunity to examine several thousands of prisoners.

Work was heavy and for at least 14 hr. daily. The diet consisted of black rye bread, dry salted fish, barley groats and tea, with occasional supplements of vegetables or meat. The patients were pale and haggard, with no visible muscle configuration or subcutaneous fat. The legs and other parts of the body were swollen, and the nails were brittle. During the short summer months, the faces, necks and backs of the hands showed a dry, scaly, pigmented eczema, and other parts also of the body were pigmented especially round suppurating sores. The state of the tongue varied from smooth and scarlet to grey and deeply furrowed with vivid red edges. The lips and corners of the mouth were sore and encrusted or peeling, and the gums pyorrhoeic. There was extreme anaemia with a weak pulse and low blood pressure. There was little fluid in the body cavities. The muscles showed degenerative reactions with few reflexes. The stools were frequent, watery and black, with some blood. Protein deficiency and pellagra predominated in the general state of malnutrition.

Treatment was primitive, but when permitted by the authorities, all but the worst cases responded to a diet of raw minced beef with or without injections of nicotinic acid. Relapse was rapid, and death frequent on return to work.

At autopsy the brain was hyperaemic, with much fluid in the subarachnoid spaces. The skeletal muscles were pale and all the fatty tissues behind the sternum and round the kidneys were gelatinous, hydropic and transparently grained. The pericardium and pleura were smooth, the heart enlarged and flaccid and the lungs hypostatic. The thymus gland could not be found and the thyroid was small. The liver and spleen were small, crumbly and watery. Both the liver and the kidneys were devoid of pattern. The adrenal glands were small, with no medulla and a thin structureless cortex. The stomach and intestinal walls were thin and of a grey colour; in a few cases only, there was penetration of dysenteric ulcers of the bacillary type.

The author had the opportunity to confirm that a similar condition prevailed in other oppressed

nations of the Soviet Union, insidious, long-standing starvation, particularly of protein, being associated with excessive physical strain.

V. R. Jackson.

1064

Symposium sur les oedèmes. [Symposium on oedema.] *Presse méd.*, 1953, **61**, 1000. Association française de Biologie médicale, 27 April 1953.

1065

GOPALAN, C., VENKATACHALAM, P. S. and SRIKANTIA, S. G. **Body composition in nutritional edema.** *Metabolism*, 1953, **2**, 335-343. [Nutrit. Res. Labs., Indian Counc. Med. Res., Coonoor.]

The patients studied were male adults in advanced stages of chronic starvation. The body composition was estimated on admission to hospital, and in some cases immediately after the disappearance of clinical oedema. In the oedematous stage the absolute plasma volume values were decidedly low; there was a large increase in extracellular fluid, and an increase in total body water, and the cellular solids constituted an abnormally small proportion of the bodyweight. After treatment there was a reduction in extracellular fluid both absolutely and relative to bodyweight, a reduction in total body water, and an absolute increase in cellular solids. The clinical grade of oedema was found to be roughly proportional to the product of the amounts of body solids per kg., extracellular fluid per kg. and intracellular fluid per kg. bodyweight. In nutritional oedema there was evidence not only of excessive extracellular but also of excessive intracellular hydration.—M. B. Richards.

1066

TORRES UMAÑA, C. Estudio sobre edema distrofico. [Study of dystrophic oedema.] *Rev. española Pediat.*, 1953, **9**, No. 50 Extraord., 279-286. [Univ. Nac. Colombia, Bogotá.] French, English and German summaries.

In infants suffering from dystrophic oedema, caused chiefly by lack of animal protein, hypochromic anaemia and leucopenia were common. An increase in the volume of the liver, with fatty degeneration, was also frequently found. In some cases purpura due to thrombopenia was observed.

M. B. Richards.

1067

BLANKHART, D. M. **Nutrition and hepatic diseases on the Island of Sangir.** *Doc. Med. geograph. trop.*, 1953, **5**, 7-24. [Mission Hosp. Taruna, Sangir, Indonesia.]

Immediately after the war, during which the intake of protein had decreased, the incidence of cirrhosis of the liver and other signs of nutritional

deficiency had increased over the pre-war level. Post-mortem examination of 17 selected patients of all ages showed marked steatosis in 3 infants, steatosis with cellular infiltration and fibrosis in 4 infants and young children, and cirrhosis in 10 patients aged from 5 to 32 years. The findings are considered to support the view that if a protein deficiency persists cirrhosis may develop in a fatty liver and that a high incidence of cirrhosis in a population suggests protein deficiency.—L. Wills.

1068

KERPEL-FRONIUS, E. and VARGA, F. **The problem of oedema in infantile malnutrition.** *Acta paediat.*, 1953, **42**, 256-264. [Dept. Paediat., Univ. Pécs, Hungary.] French, German and Spanish summaries.

In 380 severely wasted infants, oedema was found in only 8, 2 per cent. The reasons for its rarity were investigated. In most, the recognised oedema-promoting conditions were absent. In spite of low energy intake, extreme deficiency of dietary protein was rare. Dehydration often counteracted the tendency to oedema. It is concluded that oedema is common only in certain types of infantile malnutrition which occur in war time or in tropical countries and that then it is associated with low blood protein.—M. S. Fraser.

1069

JANSSEN, E. **Some aspects of kwashiorkor.** *Doc. Med. geograph. trop.*, 1953, **5**, 128-136. [Dept. Paediat., Gen. Hosp., Pretoria, S. Africa.]

A short general article deals with the literature and the author's own investigations. It is concluded that kwashiorkor is a disease of childhood, that it is produced by faulty diet and not by an infection, though infection is often the cause of death, and that isolation of the patient as a protection against infection is imperative. Arrest of growth is considered the central and most important sign; if the arrest is not treated the full syndrome develops. The long-term problem of prevention is discussed.—L. Wills.

1070

ARENDS, A. and NIEWEG, H. O. **Schadelijke gevolgen van eiwitarme voeding. [Harmful effects of low-protein diet.]** *Nederland. Tijdschr. Geneesk.*, 1953, **97**, 2123-2129. [Lab. Pathol. Anat., Rijks Univ., Groningen.] English summary.

Low-protein diets in the treatment of disease may be dangerous. Five cases are described. In the first 2, low-protein diet was prescribed for kidney disorders and continued in one for 1½ years and in the other for 6 years, after which time there was also disturbance of liver function. Both patients had macrocytic anaemia, successfully

treated by intramuscular injection of 15 μ g. vitamin B₁₂ daily. The third patient had nephritis, for which he ate a low-protein diet for a year, and "erythroblastic" anaemia. At post-mortem examination advanced atrophy of the spleen was found, in the etiology of which deficiency of vitamin B₁₂ or other member of that group may have been involved. The fourth developed necrosis of the liver in association with a half-year's low-protein diet for hypertension, and the fifth, prescribed a diet without meat, fish or egg for asthma, died with diarrhoea and steatorrhoea and with post-mortem findings of fatty liver and atrophy of the intestinal mucosa.—I. Leitch.

1071

ROMINGER, E. Vitaminmangel und Vitamintherapie im Kindesalter. [Vitamin deficiency and vitamin therapy in childhood.] *Deutsch. med. Wochenschr.*, 1953, **78**, 1245-1250. [Kinderklin., Univ. Kiel.]

A review.

1072

SELANDER, P. and GRAHNÉN, H. Rickets, spasmophilia and changes in the permanent occlusion. *Acta paediat.*, 1953, **42**, 283. *Proc.*

1073

VALENZUELA R., F. and CONTRERAS V., V. Osteoporosis. [Osteoporosis.] *Rev. méd. Chile*, 1953, **81**, 224-231. *Proc.* [Hosp. del Salvador, Santiago.]

1074

HIPSLEY, E. H. Dietary "fibre" and pregnancy toxæmia. *Brit. Med. J.*, 1953, ii, 420-422. [Australian Inst. Anat., Commonwealth Dept. Health, Canberra.]

Published observations on the incidence of toxæmia or eclampsia in population groups with different dietary habits or exposed to changes in diet are briefly reviewed, and the diets are assessed in terms of fibre content. The term fibre includes lignin, cellulose and hemicelluloses. It is concluded that toxæmia is more common where the fibre content of the diet is low and the suggestion is made that some component associated with the fibre of the diet tends to prevent the occurrence of toxæmia.—F. C. Aitken.

1075

WELLEN, I. The infant mortality in specific hypertensive disease of pregnancy and in essential hypertension. *Amer. J. Obstet. Gynecol.*, 1953, **66**, 36-45. [Dept. Obstet. Gynaecol., Coll. Med., Univ. New York.]

Infant mortality, defined as the combined still-birth and neonatal death rates, was studied among

27,028 hospital and private patients delivered during a 15-year period; 5.17 per cent. of the pregnancies were complicated by hypertensive disease, which was mainly specific hypertensive disease of pregnancy, i.e., pre-eclampsia and eclampsia, or essential hypertension, or a combination of these. Infant mortality was 2½ times normal in severe cases of the specific disease and 3 times normal when that was present as a complication of essential hypertension. In these conditions, the losses were particularly high when calculated on the basis of intrauterine deaths not explained on other grounds, e.g. foetal deformity or birth injury. The incidence and consequences of certain other features of these hypertensive cases is described, especially the nature of the delivery, and prematurity.

A. M. Thomson.

1076

WILKINSON, J. The history of onyala.

The incidence of onyala.

The pathology and etiology of onyala. *East African Med. J.*, 1953, **30**, 89-97; 161-166; 193-209. [Church of Scotland Mission Hosp., Tumutumu, P.O. Karatina, Kenya.]

Onyala is accepted as being a variant of the syndrome of essential thrombocytopenic purpura. It has never been described from outside Africa and the literature up to 1952 includes reports of cases totalling 329. The occurrence of the disease in excellently nourished persons is considered to exclude diet from any part in it.

E. M. Hume.

Vitamin A

1077

BHATTIA, I. S. Studies on vitamin 'A' deficiency. *Bull. Central Food Technol. Res. Inst. Mysore*, 1953, **2**, 204-207. [Central Food Technol. Res. Inst., Mysore.]

Dark adaptation was measured with a biophotometer in 63 adults and 37 children at Lahore in the Punjab during 1945. The adults included 20 members of the university staff and 16 research workers. Measurements were made before and after exposure to a bright light. Forty-seven per cent. of those examined had normal dark adaptation, 39 per cent. were subnormal and 14 per cent. doubtful. Abnormality was more pronounced in the children, which was attributed to the relatively greater requirement of vitamin A during growth. Abnormality was more prevalent among the less well paid, only 45 per cent. of the university menial staff having normal capacity for dark adaptation, but 61 per cent. from a higher income group.—I. M. Sharman.

1078

ORBANEJA, J. G., VIVANCO, F., PALACIOS, J., BUYLLA, A. and QUIÑONES, P. Vitamina A

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y afecciones dermatológicas. [Vitamin A and skin disease.] *Rev. clín. española*, 1953, 50, 124-129. [Clin. Dermatol., Hosp. San Juan De Dios, Madrid.] English, German and French summaries.

Vitamin A and carotene were estimated photo-colorimetrically in blood serum of 54 patients with skin diseases. In 40 per cent. the values were below 80 I.U. per 100 ml. and in 53 per cent. above 130. Improvement in the skin condition did not appear to be related to the vitamin content of the serum. The results are discussed with particular reference to the findings of Leitner and Moore (Abst. 1212, Vol. 18).—A. M. Copping.

1079

BRATISLAVSKAYA, K. I. [The role of vitamin A in treatment of dermatoses related to disturbance of keratinisation.] *Vestn. Venerol. Dermatol.*, 1950, No. 5, 40-42.

1080

SNYDERMAN, S. E., MORALES, S., CHUNG, A. W., LEWIS, J. M., MESSINA, A. and HOLT, L. E. (Jr.) Absorption of fat and vitamin A in premature infants. 3. Effect of surface active agents on the absorption of these substances. *Pediatrics*, 1953, 12, 158-164. [Dept. Paediat., Coll. Med., Univ. New York.] Spanish summary.

Healthy premature infants between 4 and 38 days of age were given a standard milk preparation of dried cow's milk and cane sugar designed to provide 130 Cal. per kg. bodyweight, 15 per cent. of the calories being from protein, 35 from fat and 50 from carbohydrate. Complete collections of faeces were made by use of metabolism frames or plastic diapers for periods of 4 days. The first period was usually arranged as a control, in the second a surface-active agent was given, and the third was again a control. In the first test 9 infants were given a supplement of Tween 80, 40 mg. per g. fat, which increased the average fat absorption from 71.8 per cent. to 81.1 per cent. and vitamin A absorption from 60.3 per cent. to 73.0 per cent. In the control period after the test fat absorption fell again only to 77.9 per cent. and vitamin A absorption to 63.4 per cent. To test the possibility that the unpalatability of Tween 80 might have had an unfavourable effect a further test with Tween G1205 was made with 11 other infants. The average percentage fat absorption then rose from 60.9 to 74.9, and the vitamin A absorption from 58.5 to 74.0. In neither series was improved absorption seen in every individual. A few other tests are reported with maize oil instead of butterfat in which absorption of fat was improved and there was then less benefit when Tween was added. Some

measure of improvement was found in an older child with biliary atresia who showed a rise in fat absorption from 46.6 to 54.3 per cent. on addition of Tween. A child with cystic fibrosis of the pancreas showed no improvement.—I. M. Sharman.

1081

KATSAMPES, C. P., MCCOORD, A. B., HAMBURGER, R. N. and CLAUSEN, S. W. Absorption of vitamin A aldehyde by children. *Pediatrics*, 1953, 12, 191-197. [Dept. Paediat., Sch. Med. Dent., Univ. Rochester, N.Y.] Spanish summary.

Single doses of vitamin A alcohol, aldehyde or acetate in concentrated solution in Wesson oil were given orally to human volunteers or patients, mostly infants and children, at the rate of 7000 I.U. per kg. bodyweight. Absorption was assessed by estimating the level of vitamin in the blood 4½ and sometimes 7 hr. later. In 5 normal children, ranging in age from newborn to 12 years, vitamin A aldehyde was efficiently converted to vitamin A. The increase in the vitamin A value of the plasma was about the same after giving vitamin A aldehyde as after giving equivalent amounts of vitamin A alcohol to the same subjects. In 5 patients with fibrocystic disease of the pancreas the value for vitamin A in the plasma was little changed after treatment with vitamin A acetate, but the increase after treatment with vitamin A alcohol or aldehyde was almost as great as in normal subjects. In 6 patients with coeliac disease the increase was much below normal with all three forms of vitamin A. Absorption of vitamin A aldehyde was examined also in 31 patients with various diseases. In 7, including cases of infestation with giardia and oxyuris, the maximum value reached in the blood plasma was from 0 to 361 I.U. per 100 ml., and absorption was considered to be poor. In 10 other patients the maximum value was from 160 to 847 I.U. per 100 ml., and in the remainder from 1102 to 4951; absorption was classed as intermediate and good, respectively.—T. Moore.

1082

DATTA, P. K. and RAJAGOPAL, K. Studies on metabolism of vitamin A. 1. Vitamin A and urine. *Indian J. Med. Res.*, 1952, 40, 487-494. [Sect. Biochem., All-India Inst. Hyg. Pub. Health, Calcutta 12.]

Specimens of urine from patients with pulmonary tuberculosis, acute nephritis, myeloid leucaemia and lobar pneumonia were examined for vitamin A, protein, uric acid and purine bodies. Of 21 samples from tubercular patients only one contained vitamin A, 18 I.U. per 100 ml.; out of 28 cases of lobar pneumonia 16 contained detectable amounts of the vitamin. No parallel was

observed between the amount of vitamin A excreted, and the amount of protein or purines excreted or the white blood cell count. When shaken with the nonsaponifiable fraction of shark liver oil most specimens of urine took up measurable quantities of vitamin A into solution. Freshly voided urine from normal subjects also took up measurable amounts of vitamin A when shaken with the nonsaponifiable fraction of halibut liver oil. The effect was not observed, however, when the urine became denatured on standing for 24 hr. or when the pH was altered. Heating had a marked effect on the solvent capacity, and boiling for 10 min. under reflux completely prevented solution. Plasma protein fractions prepared according to the method of Cohn were added to specimens of urine and their effect on the solubility of vitamin A was examined. There was a slight increase with one fraction only. Addition of xanthine and hypoxanthine slightly increased the solubility of vitamin A, but adenine and guanine had no effect.

I. M. Sharman.

1083

DHOTEL, Y. La vitamine A, régulatrice diencephalique. [Vitamin A, regulatory effect on the diencephalon.] *Acta vitaminol.*, 1953, 7, 147-150. [Amiens.] Italian, English, German and Spanish summaries.

Details are presented of patients suffering from hypertension and sleeplessness who derived benefit and recovered the capacity to sleep after quite small doses of vitamin A, 1200 "units" given orally or 1500 "units" given by intramuscular injection.—E. M. Hume.

1084

ENDTZ, W. A. Een geval van carotinaemie. [A case of carotenaemia.] *Nederland. Tijdschr. Geneesk.*, 1953, 97, 2461-2465. English summary.

A review and case history.

Vitamin E

1085

CLAROS NAVARRETE, C. Tocoferolemia en estado normal. [Blood tocopherol in healthy subjects.] *An. Fac. Farm. Bioquím., Lima*, 1951, 2, 504-515. [Lab. Bioquím. Esp., Univ. Nac. Mayor de San Marcos, Lima.]

The photocolorimetric method of Emmerie and Engel with ferric chloride was used to estimate the tocopherol content of the blood in healthy young adults, 20 men and 10 women. The values in mg. per 100 ml. serum ranged from 0.03 to 0.14 with a mean of 0.09 in the men and from 0.12 to 0.17 with a mean of 0.14 in the women. The findings are discussed with reference to reports in the literature which state that the normal values for vitamin E in human blood lie between 0.05 and

0.15 mg. per 100 ml., the amounts in plasma and serum being about the same.—A. M. Copping.

1086

Coagulazione e alfatocifero. [Coagulation and alpha tocopherol.] *Acta gerontol.*, 1953, 3, No. 2, 38-40.

A short annotation is made on the high value attributed to α -tocopherol in combating post-operational embolism.—E. M. Hume.

1087

BLATT, M. H. G., WIESBADER, H. and KUPPERMAN, H. S. Vitamin E and climacteric syndrome. Failure of effective control as measured by menopausal index. *Arch. Int. Med.*, 1953, 91, 792-799. [Dept. Obstet., Coll. Med., Univ. New York.]

Vitamin E was compared with oestrogens and other drugs as a means of controlling the climacteric syndrome. The occurrence of vasomotor symptoms, paraesthesia, insomnia, nervousness, melancholia, vertigo, fatigue, arthralgia and myalgia, headaches, palpitation and formication was observed in over 700 patients. The results were converted into menopausal indices by a system which gave more importance to some of the abnormalities, such as the vasomotor symptoms, than to others. Vitamin E, given as from 80 to 100 mg. *dl*- α -tocopheryl acetate daily, was ineffective, the symptoms being controlled in only 25.6 per cent. of patients treated with it, compared with 33 per cent. of patients given placebos. A daily dose of 0.05 mg. ethinyl oestradiol controlled the symptoms in 92.6 per cent. of patients treated, and a dose of 1.25 mg. conjugated equine oestrogenic substances in 90.8 per cent. Phenobarbital was effective in 42.8 per cent. of the patients treated.—T. Moore.

Vitamin B Complex

1088

EHRENBERG, R. and BRÖRKEN, C. Zur resorptionsfördernden Wirkung des Vitamins B₁ (Aneurin). Eine biologische Naturkonstante. [Absorption-promoting action of vitamin B₁ (aneurin). A natural biological constant.] *Naturwissenschaften*, 1953, 40, 413. [Physiol. Inst., Univ. Göttingen.]

Ten fasting subjects were given 80 g. cane sugar in 145 ml. water, alone in the first test and subsequently with 6, 8, 10, 12 or 16 mg. vitamin B₁. Blood sugar values were measured after the sugar was taken, at 10-minute intervals in the first hour and twice in the second hour. Vitamin B₁ increased the rate of absorption as indicated by the time of the maximum rise in blood sugar, and the optimum effect was obtained with 10 mg.

A. M. Copping.

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1089

- MARKES, S. Stoffwechselgrundlagen und Indikationsgebiete für eine Therapie mit Kokarboxylase. [Metabolic basis and indications for treatment with cocarboxylase.] *Deutsch. med. Wochenschr.*, 1953, **78**, 971-975. [Lab. Hoffmann La Roche, A.G., Basle.]
Review in form of a lecture.

1090

- LASCH, F. Brenztraubensäure und Kokarboxylase. Über die Bedeutung der Brenztraubensäurebestimmung im Blute für die klinische Diagnostik und die therapeutische Beeinflussung des erhöhten Brenztraubensäureblutspiegels durch Kokarboxylase. [Pyruvic acid and cocarboxylase. The significance of pyruvic acid estimation in blood for clinical diagnosis, and the therapeutic effect of cocarboxylase on the high value for blood pyruvic acid.] *Deutsch. med. Wochenschr.*, 1953, **78**, 975-976; 985-986. [Med. Abt., Landeskrankenhaus, Villach.]

1091

- KHAMIDULLINA, A. K. Vliyanie vitamina B₁ na sekretornuyu deyatel'nost zhelydka deti-distrofikov. [Effect of vitamin B₁ on gastric secretion in dystrophy in infants.] *Vop. Pediat.*, 1952, **20**, No. 6, 38-40. [Ped. Fak., Kazan. Gosud. Med. Inst.]

The parenteral administration of vitamin B₁ to dystrophic infants led to a rise in free HCl, total acidity, and peptic activity of the digestive juices, improved appetite and brought about an increase in weight. (From author's summary.)

W. Hughes.

1092

- POTVIN, L. Troubles de la nutrition chez un alcoolique. [Nutritional disturbances in an alcoholic.] *Laval méd.*, 1953, **18**, 785-790. [Serv. Méd., Hôtel Dieu, Quebec.] English summary.

A subject with chronic alcoholism had suffered from 2 attacks of beriberi in 14 months, in the first of which the liver was enlarged and showed fatty infiltration. There was an immediate response to treatment with vitamin B₁ and a diet rich in protein and sugar and poor in fat and salt; the liver became normal in size and the fatty infiltration disappeared.—L. Wills.

1093

- WOHL, M. G., SHUMAN, C. R. and TURNER, R. Effect of mercurials on thiamine excretion in patients with congestive heart failure. *Proc. Soc. Exp. Biol. Med.*, 1953, **83**, 323-325. [Nutrit. Project, Philadelphia Gen. Hosp., Pa.]

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1094

- FLOCH, H. and HORTH, R. La vitaminothérapie B₁ dans la lèpre (névrites lépreuses). [Treatment with vitamin B₁ in leprosy (neuritis of leprosy).] *Bull. Soc. Pathol. exot.*, 1953, **46**, 262-267. [Inst. Pasteur, French Guiana.]

In the neuritis of leprosy, persisting in spite of general improvement with sulphonamide treatment, large doses of vitamin B₁, 100 mg. or more, have been used for some considerable time, but the results are considered to have been negative. Other vitamins, particularly nicotinic acid and vitamin E, are considered to have been of some use as adjuvants.—E. M. Hume.

1095

- FLOCH, H., RIVIEREZ, M. and SUREAU, P. Sur la pellagre en Guyane Française. [Pellagra in French Guiana.] *Bull. Soc. Pathol. exot.*, 1953, **46**, 245-252. [Inst. Pasteur, French Guiana.]

Three cases of pellagra were encountered in 1952; 2 were undoubted alcoholics. It is considered that the diet of the people is poor and that many must be near the border line of nicotinic acid deficiency.—E. M. Hume.

1096

- BEAN, W. B. and VANCE, M. Some aspects of the tongue in pellagrous glossitis. *J. Clin. Nutr.*, 1953, **1**, 267-274. [Dept. Med., Coll. Med., State Univ. Iowa.] Spanish summary.

1097

- KHAES, S. I. Izmenenie urovnya sakhara, glikogena i molochnoi kisloty v krovi posle priema nikotinovoi kisloty. [Effect of nicotinic acid on sugar, glycogen, and lactic acid level in the blood.] *Klin. Med., Mosk.*, 1952, **30**, 88. [Kaf. Biokhim., Arkhangel. Med. Inst.]

Administration of nicotinic acid to healthy subjects increased the variations in the sugar, glycogen, and lactic acid values in the blood, the extent of the variations depending on individual sensitivity to nicotinic acid.—W. Hughes.

1098

- VINOGRADOV, A. V. [Use of nicotinic acid in coronary insufficiency.] *Klin. Med., Mosk.*, 1950, **28**, No. 10, 41-44.

1099

- LO JACONO, F. Curve glicemiche da carico orale di glucosio in lattanti affetti da sindrome carenziale prevalentemente iporiboflavinnica. [Blood sugar curve after oral administration of glucose in infants in a state of deficiency, chiefly of riboflavin.] *Boll. Soc. ital. Biol.*

sper., 1953, **29**, 120-121. [Clin. Pediat., Univ. Palermo.]

In 9 infants aged from 4 to 16 months, sugar was estimated in the capillary and venous blood after a dose of 1 g. glucose per kg. bodyweight during a state considered to be one of riboflavin deficiency and during its cure. The results were held to indicate that during the deficiency absorption of glucose from the intestine was normal but its utilisation was slightly impaired.—E. M. Hume.

1100

LA GRUTTA, A. La protidemia in alcune sindromi carenziali prevalentemente riboflaviniche. [Blood proteins in deficiency syndromes especially of riboflavin.] *Boll. Soc. ital. Biol. sper.*, 1952, **28**, 1944-1946. [Clin. Pediat., Univ. Palermo.]

Blood protein was estimated in 13 children, aged from 4 months to 3 years, with clinical signs of vitamin B complex deficiency and some degree of oedema. The values for all were low, for some very low, with the deficit chiefly in the albumin fraction. In 10 recovery of the values on dietary treatment was followed.—E. M. Hume.

1101

RUSO, G. La eliminazione urinaria di riboflavina in varie condizioni morbose. [Urinary excretion of riboflavin in various diseases.] *Boll. Soc. ital. Biol. sper.*, 1952, **28**, 1946-1947. [Clin. Pediat., Univ. Palermo.]

1102

SCURO, L. A. Studio dell'eliminazione urinaria di acido pantotenico in corso di trattamento antibiotico. [Excretion of pantothenic acid in the urine during treatment with antibiotics.] *Acta vitaminol.*, 1953, **7**, 143-146. [Ist. Clin. Med. Gen., Univ. Rome.] French, English, German and Spanish summaries.

Free pantothenic acid was estimated microbiologically in the urine of groups of 5 subjects before and for 15 days during treatment with penicillin, aureomycin, or chloramphenicol; 5 were untreated. The amount excreted in the urine by all the groups in the 24 hr. ranged from 1.62 to 3.48 mg. It fluctuated considerably but there was no consistent progressive decrease.—E. M. Hume.

1103

GHEITA, A. Pantothenic acid in the treatment of wounds. A hope or a fact? *J. Roy. Egypt. Med. Assoc.*, 1953, **36**, 239-243. [Kasr-el-Aini Hosp., Cairo.]

An ointment containing pantothenic acid was applied to ulcers and operation wounds which had previously been very slow to heal. Complete healing of the operation wounds occurred in about

10 days and of the ulcers in 25. General treatment with tonics and antibiotics was continued while the pantothenic acid ointment was applied. It was considered that healing was accelerated by the ointment.—A. M. Copping.

1104

WACHSTEIN, M. and GUDAITIS, A. Disturbance of vitamin B₆ metabolism in pregnancy. 2. The influence of various amounts of pyridoxine hydrochloride upon the abnormal tryptophan load test in pregnant women. *J. Lab. Clin. Med.*, 1953, **42**, 98-107. [Dept. Pathol., St. Catherine's Hosp., Brooklyn, N.Y.]

See also Abst. 2238, Vol. 23.

When a test dose of 10 g. DL-tryptophan was given to 86 pregnant women at term, only 4 excreted less than 3 mg. xanthurenic acid, an amount regarded as the upper limit of normal. The administration of 5 mg. vitamin B₆, 7 mg. riboflavin and 50 mg. nicotinic acid before the test had no effect on the excretion of xanthurenic acid, but excretion was normal after administration of 25 mg. pyridoxine hydrochloride between 24 hr. before and 1 hr. after the test dose of tryptophan, or of 5 to 15 mg. 30 min. before the test. A daily dose of 10 mg. pyridoxine throughout pregnancy gave a normal excretion test at term.

L. Wills.

1105

GIRDWOOD, R. H. A folic acid excretion test in the investigation of intestinal malabsorption. *Lancet*, 1953, **265**, 53-60. [Dept. Med., Univ. Edinburgh.]

Folic acid and citrovorum factor in the urine were estimated microbiologically. The test dose was 5 mg. folic acid given orally or subcutaneously; the test subjects were saturated with folic acid before the tests if it was thought that the tissues were unsaturated. In 11 control patients with other diseases, with one exception, and in 3 healthy subjects, output of folic acid was not less after the oral than after the subcutaneous dose. In 11 patients with evidence of impaired absorption from the small intestine, including idiopathic steatorrhoea, sprue and refractory iron-deficiency anaemia, excretion after the oral dose was significantly less than after the subcutaneous dose. In some of these patients there was malabsorption of some substances such as iron and folic acid, but not of others, such as fat. In 15 patients with pernicious anaemia, some treated and some in relapse, there was no evidence that the absorption of folic acid was impaired. There was no evidence of malabsorption in 5 women with megaloblastic anaemia of pregnancy, though previously the author (Abst. 5030, Vol. 23) had obtained evidence of malabsorption in such subjects. The results

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are discussed and those in the last type of case are considered to have been due to the failure sometimes of the tissues to utilise folic acid.—L. Wills.

1106

ZUMOFF, B. **Possible relationship of folic acid to uric acid metabolism as exemplified by a case of non-tropical sprue.** *Amer. J. Med. Sci.*, 1953, **225**, 674–676. [Med. Serv., Jewish Hosp., Brooklyn, N.Y.]

The blood uric acid value was high before treatment in a patient with non-tropical sprue and severe megaloblastic anaemia. On treatment with folic acid, it decreased as blood regeneration occurred. It is suggested that the increase might have resulted from an increase of the xanthine oxidase level in the tissues like that which occurs in folic-acid-deficient animals.—L. Wills.

1107

BJÖRKENHEIM, G. **Influence of folic acid on the nervous system in pernicious anemia. Experiences relating to pernicious tapeworm anemia.** *Acta med. scand.*, 1953, **145**, 406–409. [4. Med. Clin., Maria Hosp., Univ. Helsinki.]

In 75 of the 95 patients studied with pernicious tapeworm anaemia, signs and symptoms of subacute combined degeneration were present; improvement followed removal of the worm with or without administration of vitamin B₁₂. In the single subject treated with folic acid in whom nerve signs were absent, they developed after a month, during which the patient took 140 5-mg. tablets of folic acid and a small amount of liver extract, though the blood picture was normal. After withdrawal of folic acid and parenteral treatment with vitamin B₁₂ the signs improved. These findings and the literature are discussed, and it is concluded that the use of folic acid, whether with liver extract or alone, is contra-indicated in pernicious anaemia.—L. Wills.

1108

OSMOND, T. G. **Post-partum anemia: a practical treatment.** *Practitioner*, 1953, **171**, 77–80.

The Hb value of women who were anaemic after the loss of 1000 ml. or more of blood at delivery was restored to normal more rapidly when in addition to routine oral administration of iron and ascorbic acid, they were given either a single injection of crude liver extract within 24 hr. of delivery, or 6 mg. folic acid daily. The crude liver extract produced the most rapid results and the greatest subjective improvement.—L. Wills.

1109

SAWITSKY, A., MEYER, L. M., MCINERNEY, R. and DIFENBACH, W. C. L. **Oral treatment of pernicious anemia with citrovorum factor (Leu-**

covorin). *Acta med. scand.*, 1953, **145**, 332–337. [Med. Serv., Queens Gen. Hosp., Jamaica, N.Y.]

Four out of 5 patients with pernicious anaemia in relapse responded to citrovorum factor in oral doses of from 0.15 to 15 μ g. daily. An optimum response and normal blood picture were obtained with the smallest dose but the patient relapsed after 2 months' maintenance treatment with the same dose. Another patient reached and maintained a normal blood picture with 15 μ g. daily. In the other 2 patients the response was suboptimum. Leucovorin had no effect on the neurological signs.—L. Wills.

1110

DAS GUPTA, C. R., CHATTERJEA, J. B. and BASU, P. **Vitamin B₁₂ in nutritional macrocytic anaemia.** *Brit. Med. J.*, 1953, **ii**, 645–649. [Dept. Haematol., Sch. Trop. Med., Calcutta.]

In trials with 22 patients having nutritional macrocytic anaemia, improvement was assessed by the formula of Della Vida and Dyke (Abst. 2812, Vol. 12). Vitamin B₁₂, injected in amounts ranging from 30 to 300 μ g. daily, produced initially good responses in 14 of the patients but only 5 of them showed continuous improvement; the reticulocyte response was poor and macrocytosis persisted. There was no definite correlation between the nature of the response and the size of the dose. Folic acid in amounts of from 210 to 900 mg. daily was given orally to 14 of the patients who had failed to give an optimum response to vitamin B₁₂; 6 showed a good response and in 4 of them the blood picture became normal. Finally, crude liver extract was given parenterally to 8 patients whose blood had not become normal after both vitamin B₁₂ and folic acid; all improved but only 3 became normal. Vitamin B₁₂ given orally also produced a suboptimum response which was not related to the size of the dose or the degree of gastric acidity. The results suggest that there is deficiency of both folic acid and vitamin B₁₂ in nutritional macrocytic anaemia and that the folic acid deficiency is primary.—L. Wills.

1111

KLEINSORGE. "Erfahrungen mit Vitamin B₁₂." [Experiences with vitamin B₁₂.] *Folia haematol.*, 1951–53, **71**, 420–423. [Med. Poliklin., Univ. Jena.]

Experience with vitamin B₁₂ in the treatment of pernicious anaemia and in animal experiments is reported. In rabbits rendered anaemic by injection of lead the recovery time was from 14 to 16 days compared with 4 weeks in untreated anaemic animals; red cells that showed punctate basophilia disappeared rapidly on the commencement

of treatment. In the same way, in a human case of lead poisoning, 3 injections of 15 μg . vitamin B₁₂ caused the disappearance of punctate basophilia.

L. Wills.

1112

BRENNER, H. A review of 87 patients receiving treatment for pernicious anaemia. *Practitioner*, 1953, 171, 280-286.

1113

MEYER, L. M., McINERNEY, R. and RITZ, N. D. Intravenous treatment of pernicious anemia with vitamin B₁₂. *J. Clin. Nutr.*, 1953, 1, 299-301. [Med. Serv., Vet. Hosp., Bronx, N.Y.] Spanish summary.

Daily intravenous doses of 0.5 μg . to 1 patient and of 1.0 μg . to 4 patients produced a satisfactory clinical and haematological response; in 2 of the patients receiving the larger dose, the red cell count rose to 5.80 and 5.91 million per c.mm. after 41 and 87 days, respectively. None of the patients had neurological signs.—L. Wills.

1114

GLASS, G. B. J., BOYD, L. J., RUBINSTEIN, M. A. and SVIGALS, C. S. Treatment of pernicious anemia by oral administration of vitamin B₁₂ and glandular mucoprotein recovered from gastric juice of humans. *Amer. J. Med.*, 1952, 12, 109. *Proc.* [New York Med. Coll.] See Abst. 1215, Vol. 22.

1115

SCHILLING, R. F. and DEISS, W. P. Intrinsic factor studies I. Paper electrophoresis of mixture of gastric juice and radioactive vitamin B₁₂. *Proc. Soc. Exp. Biol. Med.*, 1953, 83, 506-509. [Dept. Med., Med. Sch., Univ. Wisconsin.]

Paper electrophoresis was used to study the fixation of radio-active vitamin B₁₂ in concentrated human gastric juice. It appeared that radio-active vitamin B₁₂ was bound to a component of gastric juice which moved towards the anode and was not included in one of the major protein peaks. After the mixture of gastric juice and vitamin B₁₂ had been boiled, it was difficult to localise the vitamin in electrophoresis. In electrophoresis with serum or saline, vitamin B₁₂ showed a tendency to move towards the cathode, so that the reaction with the component of gastric juice was highly characteristic and might lead to identification of Castle's intrinsic factor.—A. M. Copping.

1116

MOLLIN, D. L. and ROSS, G. I. M. Serum vitamin B₁₂ concentrations of patients with megaloblastic anaemia after treatment with vitamin

B₁₂, folic acid, or folinic acid. *Brit. Med. J.*, 1953, ii, 640-645. [Dept. Pathol., Postgrad. Med. Sch., London.]

Euglena gracilis var. *bacillaris* was used as test organism. Injections of from 20 to 1000 μg . crystalline vitamin B₁₂ were given to 33 patients with pernicious anaemia in relapse and repeated at different time intervals. The serum value for vitamin B₁₂ before treatment was below 100 μg . per ml., the lower limit of normal; after treatment the value rose to within the normal range, the height of the rise and its duration varying roughly with the size of the dose. When the mean serum value was 250 μg . per ml. the marrow was normoblastic but when the mean value decreased to 86 μg . per ml. the marrow became megaloblastic again. Estimation of the amount of the vitamin retained showed that the greater the retention the longer the serum value remained within normal limits. After the smaller doses, though the serum values were within the normal range, the mean was below that of normal subjects, but after the larger doses the mean value was as high as that of the normals. After daily parenteral doses of 40 or 1 μg . of the vitamin the serum value became normal in 1 and 15 days, respectively. Although the serum values were much higher after the bigger doses the differences in the haematological responses were less dramatic. Neither folic nor folinic acid had any effect on the serum vitamin B₁₂ value of patients with pernicious anaemia or of patients with megaloblastic anaemia due to folic acid deficiency. Very large doses of vitamin B₁₂ at the commencement of treatment are recommended to replenish the depleted tissue stores; for maintenance 40 μg . every 10 days or 160 μg . every 21 days was considered to be the minimum effective dose.—L. Wills.

1117

UNGCLAUB, W. G., ROSENTHAL, H. L. and GOLD-SMITH, G. A. Studies of human serum following oral administration of vitamin B₁₂. *Amer. J. Med.*, 1953, 14, 761. *Proc.* [Dept. Med., Sch. Med., Tulane Univ., New Orleans, La.]

1118

BAUMGÄRTEL, T. and ZAHN, D. Über den Einfluss der Darmflora auf das Vitamin B₁₂. [Influence of the intestinal flora on vitamin B₁₂.] *Klin. Wochenschr.*, 1953, 31, 619-620. [Lab. Coliforsch., Munich.]

Vitamin B₁₂ was added to cultures of *Bacterium coli*, *Bacterium lactis aerogenes* or *Streptococcus faecalis* to produce different final concentrations. The higher concentrations inhibited growth and in time proved fatal, but the lower concentrations did not inhibit at all the growth of *B. lactis aerogenes*

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during the period of observation, and only slightly that of the other organisms. These findings, and the fact that in untreated cases of pernicious anaemia from 70 to 95 per cent. of an oral dose of vitamin B₁₂ is excreted in the faeces, but when the vitamin is given with intrinsic factor only from 5 to 30 per cent. is lost, show that vitamin B₁₂ is not destroyed by these intestinal organisms, which are present in the stomach and small intestine as well as in the large intestine of patients with pernicious anaemia.—L. Wills.

1119

BLOQUIAUX, S. Vitaminémie B₁₂ chez les sujets sains ou atteints de dermatoses allergiques. [Vitamin B₁₂ in the blood in health and in allergic dermatoses.] *C.R. Soc. Biol.*, 1953, **147**, 713-716. [Lab. Microbiol. Gén., Univ. Liège.]

Vitamin B₁₂ was estimated with *Lactobacillus leichmannii* in the blood of 10 normal subjects and of 9 with eczema or erythroderma. The normal values ranged from 1.03 to 1.55 µg. per litre and those for patients with dermatitis from 0.85 to 8.25. It was thought possible that the abnormally high values were due to substances other than vitamin B₁₂ which stimulated growth of *L. leichmannii*, and it was observed that very small amounts of histamine stimulated the growth of the micro-organism in the presence of suboptimum amounts of vitamin B₁₂.—A. M. Copping.

1120

WATKIN, D. M., LANG, C. A., CHOW, B. F. and SHOCK, N. W. Agewise differences in the urinary excretion of vitamin B₁₂ following intramuscular administration. *J. Nutrition*, 1953, **50**, 341-349. [Sect. Gerontol., Nat. Heart Inst., Nat. Inst. Health, Bethesda, Md.]

The urinary excretion of vitamin B₁₂ in the 24 hr. after a single intramuscular injection of 20, 30, 50 or 75 µg. of the vitamin was studied in 107 men of widely spread ages. The older men were free from clinically apparent liver or kidney disease, or diabetes. *Lactobacillus leichmannii* was the test organism and amounts above 0.01 µg. could be estimated by the method. In a preliminary test with 19 young men of average age 29.7 and 16 men of average age 76.4 years, significantly more vitamin B₁₂ was excreted by the young men at all levels of administration. In a second study a young group of average age 28.0 years, a middle-aged group of 61.1 years and an old group of 81.6 years excreted less of injected vitamin B₁₂ with increasing age. The decrease was related to the decrease in efficiency of renal function with rising age, but the effect could not be related to renal function alone.—A. M. Copping.

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1121

THOMSON, R. M. Megaloblastic anaemia associated with enterocolic anastomosis: report of a case responding to vitamin B₁₂. *Glasgow Med. J.*, 1953, **34**, 270-274. [Royal Infirmary, Glasgow.]

No case has been previously described in which macrocytic anaemia ensuing from enterocolostomy has been effectively treated with vitamin B₁₂.

The operation took place 9 years previously. A single injection of Anahaemin produced a good reticulocyte response but the blood picture soon again deteriorated. The next injection was of 40 µg. vitamin B₁₂. It produced another good response which was maintained with further injections of the same amount.

By operation, the original anastomosis of the gut was undone and the non-functioning but healthy loop of the ileum was restored to continuity. The blood picture was subsequently satisfactorily maintained without further treatment.—E. M. Hume.

1122

SWENDSEID, M. E., HALSTED, J. A. and LIBBY, R. L. Excretion of cobalt⁶⁰-labeled vitamin B₁₂ after total gastrectomy. *Proc. Soc. Exp. Biol. Med.*, 1953, **83**, 226-228. [Veterans Admin. Centre, Med. Centre, Univ. California, Los Angeles.]

When 0.5 µg. vitamin B₁₂ labelled with ⁶⁰Co was given by mouth to 4 patients after total gastrectomy, all the radio-activity was recovered from the faeces within 4 days. If 50 or 100 ml. gastric juice were given with the vitamin B₁₂ the proportion excreted in the faeces was from 6 to 18 per cent., an amount of the same order as in normal subjects.—A. M. Copping.

1123

CORDA, G. Modificazioni nell'eliminazione dei corpi creatinici in distrofici muscolari durante il trattamento con vit. B₁₂.] **Modification in the elimination of creatine bodies in muscular dystrophy during treatment with vitamin B₁₂.** *Boll. Soc. ital. Biol. sper.*, 1952, **28**, 1935-1937. [Clin. Pediat., Univ. Sassari.]

Creatine and creatinine were estimated daily in the blood of two brothers of 12 and 4 years, and of a girl of 5, with severe muscular dystrophy, before and during daily intramuscular injection of 30 µg. vitamin B₁₂, given for 2 periods of 12 days with a 7 days' interval. For a third period of 8 days an intramuscular injection of 0.5 g. choline was given in addition twice daily. In the boys there was some decrease in the values for creatine and increase in those for creatinine; the effect was more pronounced, and the approach to the normal was greater, when choline also was given.

In the girl the departure from normal values was slight, and little effect was seen.

There was no clinical improvement.

E. M. Hume.

See also Abst. 843.

Vitamin C

1124

KIRK, J. E. and CHIEFFI, M. **Vitamin studies in middle-aged and old individuals. 11. The concentration of total ascorbic acid in whole blood. 12. Hypovitaminemia C. Effect of ascorbic acid administration on the blood ascorbic acid concentration.** *J. Gerontol.*, 1953, 8, 301-304; 305-311. [Div. Gerontol., Sch. Med., Washington Univ., St. Louis, Mo.]

11. Sixty-one men and 81 women, aged from 40 to 103 years, living in an institution, received a diet containing 45 mg. ascorbic acid daily. Ascorbic acid was estimated in fasting blood and the values were compared with those for subjects aged from 16 to 39 years taking a self-selected diet. In the men, the values decreased significantly from 0.59 mg. per cent. at ages from 40 to 59 to 0.33 at ages from 80 to 103. Values in women were 0.48 in the age group from 40 to 59 and 0.40 in the age group from 80 to 87, but the difference was not significant. Average values for young men were twice as high as for old men, and for young women two and a half times as high as for old women. A possible correlation is suggested between the degree of debilitation in old subjects and the concentration of ascorbic acid in the blood. The men were generally more debilitated than the women.

12. Ten men of average age 70 years and 9 women of average age 64 years, with an average blood ascorbic acid value of 0.26 mg. per cent., received 100 mg. ascorbic acid daily for 14 weeks. Blood ascorbic acid was estimated after 2, 5, 10 and 14 weeks, and 2, 4 and 8 weeks after discontinuation of treatment. In 16 of the patients there was a marked rise in the value, the maximum of 1.15 mg. per cent. being reached after 5 weeks. When the treatment was discontinued the values fell, reaching 0.31 mg. per cent. after 8 weeks. In the 3 remaining cases, there was no rise; in one of them the blood value rose to between 1.27 and 1.57 mg. per cent. when the daily oral dose of ascorbic acid was increased to 300 mg., but with as much as 1000 mg. daily there was no rise in the others; in all three, parenteral administration of 200 mg. 3 times weekly effectively increased the blood values.

The significance of low values for blood ascorbic acid in the aged is not established, and there is no definite indication at present for treatment since the low values are not accompanied by scurvy or other clinical signs.—V. R. Jackson.

1125

SMIRNOVA, M. C. **Vliyanie nekotorykh lekarstvennykh veshchestv na sodержanie askorbinovoi kisloty v krovi. [Effect of certain drugs on the content of ascorbic acid in the blood.]** *Klin. Med., Mosk.*, 1952, 30, No. 6, 86-87. [Kaf. Biokhim., Arkhangel. Med. Inst.]

Healthy men were given vitamin C to saturation as evidenced by excretion in the urine. White streptocide [presumably a sulphonamide] and aspirin were then administered at the rate of 0.5 g. each, three times a day, and KI (3 per cent. solution) 1.2 g. in the course of one week. The ascorbic acid content of the blood was reduced in comparison with that of the blood of subjects not given the drugs.—W. Hughes.

1126

ANDRIANOVA, V. N., MATUSSIS, I. I. and NAUMOVA, A. I. **Flyuoresstsenovaya proba na pronitsaemost' kapillyarov i ee dinamika v zavisimosti ot obespechennosti organizma vitaminom C. [Fluorescein test of capillary permeability and relation of its dynamics to organic vitamin C.]** *Klin. Med., Mosk.*, 1952, 30, No. 6, 86. [Gorky Nauch. Issled. Dermat.-Venerol. Inst.]

With the fluorescein test proposed by Oivin and Bogdanova in 1950 it was shown that as vitamin C deficiency developed in guineapigs, the absorptive capacity of the skin capillaries increased. In the case of healthy men, for a content of 0.31 mg. per 100 ml. of ascorbic acid in the blood, the average time for the disappearance of the fluorescence of the sodium salt of fluorescein introduced into the skin was 91 min. ($\sigma \pm 23$ min.), while for a content of 1.02 mg. per 100 ml. the time was 73 min. ($\sigma \pm 17$ min.).—W. Hughes.

1127

MEL'NIKOV, A. A. **Vliyanie vitamina C i khloristogo kaltsiya na dinamiku krovnogo davleniya i lomkost' kapillyarov u bol'nykh gipertonicheskoi bolezn'yu. [Effect of vitamin C and calcium chloride on blood pressure dynamics and capillary fragility in hypertension.]** *Klin. Med., Mosk.*, 1952, 30, No. 6, 85. [Gospital. Terapevtik. Klinik., Yaroslav. Med. Inst.]

In 72 patients suffering from hypertension, administration of vitamin C reduced neurovascular excitability and increased the resistance of the vascular motor apparatus to cold, nicotine, and water tests, particularly when used in conjunction with CaCl_2 .—W. Hughes.

1128

JOLI DELPINO, A., M. **Ascorbinuria en el ciclo menstrual, embarazo y climaterio. [Ascorbic**

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acid in urine in the menstrual cycle, in pregnancy and in the menopause.] *An. Fac. Farm. Bioquim., Lima*, 1951, **2**, 468-486. [Lab. Serv. Sanidad Militar., Univ. Nac. Mayor de San Marcos, Lima.]

The results of studies in Bombay by Pillay (Abst. 890, Vol. 10) are discussed. The urinary excretion of ascorbic acid in 6 young women having a diet rich in ascorbic acid was measured by the indophenol method through several menstrual cycles. The maximum retention and minimum excretion occurred between the thirteenth and seventeenth days of the cycle. The relation of this to ovulation time is discussed. In 5 pregnant women and in one at the time of the menopause no marked retention of ascorbic acid occurred during a 30 days' study and there was little variation in the amount excreted.

A. M. Copping.

1129

NORIEGA PANCORVO, E. Influencia de la insulina sobre la ascorbinemia del diabético. [Effect of insulin on blood ascorbic acid in diabetics.] *An. Fac. Farm. Bioquim., Lima*, 1951, **2**, 335-404 [344]. [Lab. Hosp. Militar "San Bartolomé", Univ. Nac. Mayor de San Marcos, Lima.]

Some preliminary experiments indicated that when insulin was incubated with guineapig blood it had no effect on the ascorbic acid content of the blood, as estimated by indophenol titration.

In human subjects the amounts of ascorbic acid in the blood of normal and diabetic persons were within the same range before insulin was given to the diabetics, but after a dose of 10 units there was a decrease of from 19 to 39 per cent. in the value. The values rose to within the normal range when insulin was discontinued for 3 days. There was no apparent correlation between the values for blood sugar and ascorbic acid in diabetic patients.

A. M. Copping.

1130

ROUSSEAU, J. Association de cortisone et d'acide ascorbique dans l'arthrite à forme rhumatoïde. [Association of cortisone and ascorbic acid in arthritis of rheumatoid type.] *Laval méd.*, 1953, **18**, 581-587. [Hôp. Anciens Combattants, Quebec.]

Eight patients with rheumatoid arthritis or ankylosing spondylitis were treated in turn with 25 mg. cortisone daily, with and without 200 mg. ascorbic acid daily. In 3 ascorbic acid seemed to enhance and prolong the effect of cortisone.

E. M. Hume.

1131

AL'TGAUZEN, V. L. and LOPSKAYA. [Ascorbic acid in treatment of skin tuberculosis.] *Vestn. Venerol. Dermatol.*, 1950, No. 5, 43-46.

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1132

BROWN, S. S. and CHURCH, J. F. Ascorbic acid in public and preparatory school meals. *Proc. Nutrit. Soc.*, 1953, **12**, i-ii. [Food Res. Lab., Peter Merchant, Ltd., 16 Bell St., Henley-on-Thames, Oxon.]

Vitamin D

1133

FOLLIS, R. H. (Jr.), PARK, E. A. and JACKSON, D. The relationship of vitamin D administration to the prevalence of rickets observed at autopsy during the first two years of life. *Bull. Johns Hopkins Hosp.*, 1953, **92**, 426-443. [Dept. Paediat., Sch. Med., Johns Hopkins Univ., Baltimore, Md.]

A high incidence of rickets had been found at histological examination of the bone in 1303 children coming to autopsy in the first 2 years of life (Abst. 3524, Vol. 23). The same set of data was analysed to ascertain the intake of vitamin D by the children. Much of the data was necessarily of doubtful accuracy, and the analysis was confined to data from children whose histories were deemed reliable.

Of 147 full-term children from 1 to 24 months old, having had no vitamin D, rickets was present in 102, being moderate or severe in 74. Further analysis showed that, in those with and without rickets, the duration of the terminal illness, the state of nutrition, and the month of death, were about the same, but the histological picture of the costochondral junctions showed that in one-third of those without rickets little growth had occurred.

Rickets was present in 12 of 16 premature infants, aged from 1 to 6 months, given no vitamin D. The proportion was about the same as in full-term infants of the same ages.

There were 107 full-term children who had received vitamin D while in hospital for from 7 to 20 days or for more than 20 days. Generalisation was very difficult, but there was a larger proportion with severe rickets among those treated for the shorter period; in some there was healing.

Among 30 premature infants up to 6 months old, who had received vitamin D for varying periods, 22 had rickets.

It is considered probable that the individual requirement of vitamin D is one of the chief variables.—E. M. Hume.

1134

SCHMIDTMANN, M. 25 Jahre Vitamin-D-Behandlung vom pathologisch-anatomischen Standpunkt aus betrachtet. [Twenty-five years of treatment with vitamin D from the standpoint of pathological anatomy.] *Deutsch. med. Wochenschr.*, 1953, **78**, 1300-1302. [Pathol. Inst., Katharinenhosp., Stuttgart.]

1135

SCHMUZIGER, P. Familiärer persistierender Phosphatdiabetes mit D-Vitamin-resistenter Rachitis (Befunde an zwei Milchzähnen). [**Familial persistent phosphate loss with rickets resistant to vitamin D. Findings on two milk teeth.**] *Helv. paediat. Acta*, 1953, **8**, 276-279. [Chirurg. Abt., Zahnärztl. Inst., Univ. Zürich.] French, Italian and English summaries.

Two milk teeth were examined which had dropped out spontaneously at the age of $3\frac{1}{2}$ from one of the subjects described by Fanconi and Girardet (Abst. 2880, Vol. 22). External signs of rickets were absent from the teeth; there was no hypoplasia and no root resorption. Examined microscopically the enamel and dentine were grossly underdeveloped, and the interglobular substance was poorly calcified. There was no evidence of cessation of the pathological process, which was most active in the layers of dentine formed last.—E. M. Hume.

1136

LORENZINI, R. Ipercalcemia da carico di CaCl_2 e da vitamina D_2 in portatori di gerontoxon ed in rapporto all'età. [**Blood calcium after test administration of CaCl_2 and of vitamin D_2 in patients with arcus senilis and in relation to age.**] *Acta gerontol.*, 1953, **3**, No. 2, 3-12. [Ist. Clin. Med., Univ. Modena.] English and French summaries.

Ca was estimated in the blood serum of 41 male subjects, 20 normal and 21 showing *arcus senilis*. The normal subjects included 4 of mean age 23, 5 of mean age 51, and 11 of mean age 67. The subjects with *arcus senilis* included 8 of mean age 38, and 13 of mean age 64. A dose of CaCl_2 was given intravenously, supplying 0.182 g. Ca, and estimations were made beforehand and after 3, 30 and 90 min. On the next 3 days an intramuscular injection of 15 mg. vitamin D_2 was given, and on the last of these the response to injection of CaCl_2 was tested again. In the subjects without *arcus senilis* the curve of response was somewhat higher the greater the age. After administration of vitamin D_2 the curves bore the same relation to one another, but were all at a somewhat higher level. In the subjects with *arcus senilis* the effect was the same, but the curves lay at a higher level than in those without, and the rise caused by vitamin D_2 was greater.

E. M. Hume.

1137

JONXIS, J. H. P. and HUISMAN, T. H. J. **Amino-aciduria in rachitic children.** Amino-acidurie bij rhachitische kinderen. [**Amino-aciduria in rachitic children.**] *Lancet*, 1953, **265**, 428-431; *Voeding*, 1953, **14**, 400-407. [Kind-erklin., Acad. Ziekenhuis, Groningen.]

It had been shown that children with rickets excrete in the urine more than the normal amount of α -amino-acids (Abst. 2280, Vol. 23), and it was sought to ascertain the nature of the amino-acids contributing to the increase. Detailed studies were made on 5 children, 2 with ordinary rickets, 1 with resistant rickets and 2 normal controls. The children with rickets were chosen for the study as representing typical classes of rachitic children; the first at 8 months of age normally fed but without vitamin D, the second, at 7 months of age, fed on milk only and without vitamin D, the third, 4 years old, admitted for the second time with resistant rickets, for which he had in the past received 100,000 I.U. vitamin D_3 daily for 10 days.

During the test period, diet was uniform and the chief source of protein was 500 ml. cow's milk. Urine amino-acids were estimated by chromatography on the cation exchange resin Dowex 50. Complete separation was not achieved between threonine and serine, between glycine and alanine, or between tyrosine and phenylalanine. Total urine amino-acids in mg. per 24 hr. for the 5 children in the above order were 453, 754, 898, 311 and 263 before treatment, and after administration of vitamin D_3 , a single dose of 300,000 I.U. to the first and second and 1 million I.U. daily for 16 days to the third child, 265, 590, 709. The normal children received no vitamin D.

The high excretion of amino-acids was due to threonine and serine, glycine and alanine, histidine, lysine and bound glutamic acid. The children with ordinary rickets excreted no cystine before or after vitamin D_3 ; the others did. Only the first child showed normal excretion in general after treatment; in the second, loss of glutamic acid continued high, and in the third it increased.

Comparison of the amino-acid in ultrafiltrates from plasma of a normal and a rachitic child showed nothing abnormal in rickets. Tubular re-absorption was tested in 3 normal and 3 rachitic children with intravenous injection of histidine and arginine. Of the injected amounts the normals excreted 3.6 per cent. of histidine and 0.2 per cent. of arginine; the patients 32.5 and 0.3 per cent.

Further studies showed that other members of the family of the second child were excreting an excess of amino-acids and that the resistant rickets of the third was familial also. The quantities of the chief amino-acids lost were not serious in relation to the amounts supplied in the food.

The results are discussed in relation to theories of rickets and other disorders in which failure of re-absorption of amino-acids occurs, such as cystinuria. It is suggested that the excessive loss of alanine and glycine is in some way connected with the failure of tubular re-absorption of P in rickets.—I. Leitch.

1138

SALVESEN, H. A. and BÖE, J. **Osteomalacia in sprue.** *Acta med. scand.*, 1953, **146**, 290-299. [Med. Clin. B, Rikshosp., Univ. Oslo.]

Of 85 patients with sprue, 40 had the serum levels of Ca or P or both so far reduced that the Ca \times P product fell below 27, and a chemical diagnosis of osteomalacia was made. Radiography showed bony changes in 22 of the 40; 4 had Milkman's pseudofractures, 3 late rickets and the rest osteoporosis. In the 7 with marked bony changes the value for serum phosphatase was high, for serum Ca slightly reduced, and for serum P considerably reduced. In 3 patients with tetany and osteoporosis the serum phosphatase levels were normal but those for serum Ca and P were low, and the Ca \times P product was very low; in spite of the low product, bony changes were slight. The remaining 12 patients with bony changes showed osteoporosis but not tetany, though the blood findings were like those in patients with tetany. All the patients responded to vitamin D. For comparison with the patients with bony changes, 12 without bony change were studied; all had low serum Ca values but normal ones for serum phosphatase and P, and 7 suffered from tetany. On treatment with vitamin D the value for Ca rose but not for P. A low serum P in the patients with bony lesions was considered evidence of hyperparathyroidism which, in those with low serum Ca, was not sufficient to mobilise enough Ca from the bones to protect from tetany. In those without bone lesions normal P and low Ca values in the serum were considered evidence of hypoparathyroidism, the possible cause of which is discussed.—L. Wills.

1139

KÖBL, H. Ekzembehandlung mit Vitamin D. [Treatment of eczema with vitamin D.] *Wien. klin. Wochenschr.*, 1953, **65**, 524-528. [Kind-erklin., Univ. Vienna.]

Twelve infants in the first 18 months of life, with severe weeping eczema, were injected intravenously with a special aqueous preparation of vitamin D₂ (Wander), a total of from 15 to 30 mg. being given within 12 days. There was dramatic healing in all except one to which physiological saline was given with the vitamin. The mode of action is discussed, and it is recommended that a salt-free diet should accompany the treatment but that a diet low in protein is not necessary.

E. M. Hume.

1140

PANJA, D. and BANERJEE, A. K. **Value of streptomycin, calciferol and sulphones in cutaneous tuberculosis.** *J. Indian Med. Assoc.*, 1953, **22**, 436-444. [Dept. Dermatol., Sch. Trop. Med., Calcutta.]

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Skin tuberculosis was treated with calciferol in 30 patients, streptomycin in 12, streptomycin and diaminodiphenylsulphone in 8, diaminodiphenylsulphone in 25, streptomycin and calciferol in 10, and diaminodiphenylsulphone and calciferol in 17. Streptomycin with calciferol or the sulphone gave the best results; any one of the substances gave a better result in combination with another than alone.—E. M. Hume.

1141

GRANBOIS, J. La vitamine D₂ (calciférol) dans le traitement des tuberculoses cutanées, cutané-osseuses et de diverses dermatoses. [Vitamin D₂ (calciferol) in treatment of tuberculosis of the skin and bones and of various dermatoses.] *Laval méd.*, 1953, **18**, 502-537; 652-701. [Serv. Dermatol., Hôtel-Dieu, Quebec.]

1142

RUZICZKA, O. Beobachtungen bei gehäuft auftretender D-Hypervitaminose. [Vitamin D excess by accumulation.] *Monatsschr. Kinderheilk.*, 1953, **101**, 175-176. *Proc.* [Vienna.]

Other Vitamins

1143

FERSTL, A. and LACHNIT, V. Die Gefahren der Dicumarintherapie während der Lactation. [The dangers of dicoumarol treatment during lactation.] *Klin. Wochenschr.*, 1953, **31**, 539-541. [2. Med. Klin., Univ. Vienna.]

The anticoagulant content of human milk was estimated in 6 lactating women with a daily output of milk ranging from 150 to 1500 ml. after a single oral dose of 900 mg. 3:3-ethylidene-bis-4-oxy-coumarin. Blood prothrombin, total milk output and dicoumarol output in milk and urine were estimated daily for 5 days after administration of the test dose, no other medication being given. The mean dicoumarol content of the milk on the first day was 297 μ g. per ml., range 266 to 326; the highest concentration was found in milk from the subject with the smallest secretion. The values for milk were 10 times higher than for serum, possibly because at 37° C. serum is saturated with dicoumarol at a concentration of about 50 μ g. per ml., and human milk at one of about 450 μ g. per ml. The concentration decreased in the milk during the 5 days of observation, but in 2 patients with a very low total secretion it was still high at the end of this period. In these 2 subjects the urinary output was low; in the others it was high on the first day and fell gradually during the next 4 days. The blood prothrombin value fell to a minimum on the second or third day and had returned to normal by the fifth day in all the subjects. The larger the total output of milk the greater the loss of dicoumarol in it, and the smaller

the fall in the blood prothrombin value, so that the larger the milk output the larger the dose of dicoumarol required to produce the desired fall in the blood prothrombin level. The findings show the risk to a nursing infant of receiving an overdose of dicoumarol if the mother is being treated with it, and are a contra-indication for oral administration of dicoumarol during lactation.

L. Wills.

DENTAL DISEASES

1144

CAMERON, D. A. **An investigation of the caries experience and diet of groups of school and pre-school children in Sydney (1946-1947).** *Dent. J. Austral.*, 1953, **25**, 50-56. [Inst. Dent. Res., Chalmers St., Sydney.]

The occurrence of dental caries in 1044 children 2 to 12 years was recorded in conjunction with dietary survey data obtained by the questionnaire method from 906 of the subjects. The information got from the dietary records was not entirely satisfactory, but from it a picture was drawn of the type of diet scale to which the children were accustomed and a comparison was made, in general terms, with recommended allowances.

Only 11 per cent. of the children, all of whom were below 8 years of age, were free from caries. Maximum values of 12.6 and 13.6 for the mean number of DMF teeth per child for boys and girls were reached at 8 and 7 years, respectively, and of 19.1 and 19.0 for DMF surfaces per child for boys and girls at 6 and 7 years of age.

The view that too high a proportion of energy comes from refined carbohydrates is expressed and discussed in relation to other published work.

D. Harvey.

1145

DEMOLE, V. and HELD, A. J. **Fluor et santé générale. État de santé de la population autochtone et immigrée du village de Sembrancher. [Fluorine and general health. State of health of the native and immigrant population of the village of Sembrancher.]** *Schweiz. med. Wochenschr.*, 1953, **83**, 362-364. [Lausanne.]

The population examined consisted of 750 persons, mostly indigenous but including a small group of labourers and their families who had immigrated into the valley from 9 to 19 months before the study was made. These people and, in the case of the natives, their forebears as well, used a water supply containing from 1 to 1.4 mg. F per litre. No evidence could be obtained of any toxic effect; the incidence of otosclerosis, enlargement of the thyroid gland and rheumatism was not greater than in the general population. The incidence of dental caries was low; there was no mottling of enamel.—L. Wills.

1146

CLAPPER, W. E., DOWNS, R. A. and HEATHERMAN, M. E. **The relation of caries activity to lactobacillus counts and types and to the fluoride content of drinking water. 2. Results of examinations made after a one-year interval.** *J. Dent. Res.*, 1953, **32**, 440-444. [Dept. Microbiol., Univ. Colorado Sch. Med., Denver.]

A re-examination was made of 312 of 383 children in Denver, an F area, and in Boulder, an F-free area, and from the saliva of 73 and 70 in these areas, respectively, lactobacilli were isolated, counted and typed (see Abst. 5061, Vol. 23). There was evidence that of the Denver children, with 1 p.p.m. F in their drinking water, who were caries-free at the previous examination, those with high counts of rhamnose-fermenting lactobacilli were more likely to develop caries than those in the same area but without that type of organism. Where there was no F in the water, caries appeared in nearly all the children, irrespective of the type or number of organisms. Fluoride in the amount of 1 p.p.m. F in the water was without effect on the type of organism which became established.

D. Harvey.

1147

MITRANI, R. M. **El fluor como preventivo de la caries dental. [Fluorine as preventive of dental caries.]** *Bol. Ofic. sanit. panamer.*, 1953, **34**, 245-255. [Havana, Cuba.] English summary.

The evidence for the value of F in drinking water as a preventive of dental caries is discussed with reference to studies of the problem in North America. The effects of addition of fluoride to drinking water and of the topical application of fluorides to children's teeth are considered. In Cuba, where the F content was not above 0.4 p.p.m. in 250 samples of water examined, the incidence of dental caries is estimated to be 95 to 98 per cent. The cost of adding F to raise the content to 1 p.p.m. was calculated to be very low relative to the benefits likely to accrue. An alternative suggestion was the topical application of fluoride to children's teeth at the ages of 3, 7, 10 and 13 years, but this would probably cost more.

A. M. Copping.

1148

OCKERSE, T. **Chronic endemic dental fluorosis in Kenya, East Africa.** *Brit. Dent. J.*, 1953, **95**, 57-60. [Union Health Dept., South Africa.]

At 4 centres where European children were examined 112 were found with mottled enamel. Asian and African children were more permanently resident in their particular districts than were Europeans and when the percentage incidences were calculated for the 712 Asian and 592 African children examined they were 67 and 47 per cent.,

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respectively. The degree of mottling, which varied from questionable through very mild, mild and moderate to severe, was in most cases only very mild or mild. There was evidence that the F content of the supplies of drinking water, which are mainly from recent volcanic strata, was excessive. The incidence of dental caries was very low.—D. Harvey.

1149

SATYANARAYANA MURTHI, G. V., NARAYANA RAO, D. and VENKATESWARLU, P. **Studies of endemic fluorosis (Visakhapatnam and suburban areas) : spinal compression due to skeletal fluorosis.** *J. Indian Med. Assoc.*, 1953, **22**, 396-399. [Andhra Med. Coll., Visakhapatnam.]

The finding of advanced fluorosis in an adult man, clinical details of which are given, prompted examinations of the population of the district for "stiff-back" and of their water supplies for F. A range from 1.2 to 11.0 p.p.m. F was found in samples from 17 sources of supply. The patient and his neighbours, in whom signs of fluorosis were not so common as had been expected, had been consuming water with a content near the upper level, but where it was less than 3.8 p.p.m. "stiff-back" was unknown. It is concluded that an amount up to 4 p.p.m. is not hazardous.

D. Harvey.

1150

VENKATESWARLU, P., NARAYANA RAO, D. and RANGANATHA RAO, K. **Studies in endemic fluorosis : Visakhapatnam and suburban areas. Fluorine, mottled enamel and dental caries.** *Indian J. Med. Res.*, 1952, **40**, 535-548. [Dept. Biochem., Andhra Med. Coll., Visakhapatnam.]

Investigation of the water supplies in the Visakhapatnam area is proceeding, and in 39 localities the F content has been found to range from traces to 11.0 p.p.m. In 12 villages where it ranged from 0.3 to 1.6 and averaged about 1 p.p.m. records were made of the teeth of 1009 children according to a scheme based on the Evanston Study (Abst. 3626, Vol. 18). Calculations were also made of a dental fluorosis index for each district from the degree of mottling and its frequency of occurrence.

The general relationship between incidence of caries and F content of drinking water was confirmed, but in 6 villages with nearly the same amounts of between 0.8 and 1.0 p.p.m., the DMF rate was found to range widely for the age group 7 to 9 years. There existed also in these villages a marked variation in the incidence of mottling; in 2 villages each with 0.9 p.p.m. the incidences were 5 to 45 per cent. In general where F contents were similar caries fell in amount

as the dental fluorosis index rose. In 1 exceptional community a low incidence of mottling was associated with a low incidence of caries, a finding which lent support to the hypothesis of Dean *et al.* (Abst. 3646, Vol. 9).

Seven years before the study the population of one village had migrated from an area where the F content was 1.6 to another where it was between 0.5 and 0.8 p.p.m. Among the children born after the movement who at the time of examination were from 3 to 6 years of age there was both a high incidence of mottled enamel and a high resistance to caries, from which it is concluded that transmission of F across the placenta and by way of the mammary gland may influence the incidence of both defects in the young child.

D. Harvey.

1151

KUTLER, B. and IRELAND, R. L. **The effect of sodium fluoride application on the dental caries experience in adults.** *J. Dent. Res.*, 1953, **32**, 458-462. [Coll. Med., Univ. Nebraska, Omaha.]

Adult students numbering 147 with age range 20 to 42 and mean age 24 years had 2 quadrants of their mouths treated with 4 applications of a 2 per cent. solution of NaF. Re-examination was made about 13.5 months later. There was no significant difference in the incidence of new caries in the treated and untreated quadrants, nor was there any significant reduction in the incidence of caries on the basis of total new caries.

D. Harvey.

1152

WINKLER, K. C., DIRKS, O. B. and VAN AMERONGEN, J. **A reproducible method for caries evaluation-test in a therapeutic experiment with a fluorinated dentifrice.** *Brit. Dent. J.*, 1953, **95**, 119-124. [Lab. Hyg., Univ. Utrecht.]

The reproducibility of evaluation by a method previously described (Title 3142, Vol. 21) was tested with a longer interval between the X-ray photographs, 18 months instead of 14 days in the earlier investigation. Over this period reproducibility was again found to be good.

During the period 2 comparable groups of boys of 11 to 15 years of age used the same basic dentifrice, which was fluoridated for the one and fluorine-free for the other, and the effects on approximal caries in premolar and molar regions were examined. In the fluoridated paste total F amounted to 650 $\mu\text{g.}$ per g. and soluble F to 335 $\mu\text{g.}$ per g. and a mean amount of 0.75 g. was used daily by each boy. There was no prophylactic value which could be attributed to the F in the paste.

An extension of the investigation to anterior teeth is in progress.—D. Harvey.

1153

ADLER, P. and STRAUB, J. **A water-borne caries-protective agent other than fluorine.** *Acta med. hung.*, 1953, **4**, 221-227. [Dept. Stomatol., Med. Sch., Univ Debrecen.] Russian summary.

Generally speaking, field studies in Hungary have confirmed the caries-protective effect of drinking waters containing about 1 p.p.m. F (Abst. 4110, Vol. 21). Nevertheless, the results for 2 communities in the Hungarian plain about 15 km. apart, served by a number of artesian wells, were discrepant, that with the water of lower F content, from 0.13 to 0.60 p.p.m. having a surprisingly low incidence of caries among the schoolchildren. Since the populations were similar in race, socio-economic status and food habits, it is suggested that the waters in the favoured district contain some unknown substance, probably a trace element other than F, with a direct caries-preventing effect.

W. M. Deans.

POISONS: PATHOGENIC ORGANISMS: FOOD LAWS

1154

WILLIAMS, R. R. **Nutritional consequences of food laws.** *Proc. Nat. Food Nutrit. Inst.*, December 1952; *U.S. Dept. Agric., Agric. Handbook* No. 56, 93-95. [Res. Corp., New York.]

1155

CRAWFORD, C. W. **Limitations of consumer food protection under existing laws.** *Proc. Nat. Food Nutrit. Inst.*, December 1952; *U.S. Dept. Agric., Agric. Handbook* No. 56, 96-102. [Food and Drug Admin., Fed. Sec. Agency.]

1156

LAMOUREUX, V. B. **Atomic warfare and food.** *Proc. Nat. Food Nutrit. Inst.*, December 1952; *U.S. Dept. Agric., Agric. Handbook* No. 56, 109-111. [Fed. Civil Defense Admin.]

1157

ERICKSON, F. K. **Biological warfare and food.** *Proc. Nat. Food Nutrit. Inst.*, December 1952; *U.S. Dept. Agric., Agric. Handbook* No. 56, 112-116. [Emergency Sanitation Branch, Health and Special Weapons Defense Div., Fed. Civil Defense Admin.]

1158

ALPHIN, T. H. **Chemical warfare and food.** *Proc. Nat. Food Nutrit. Inst.*, December 1952; *U.S. Dept. Agric., Agric. Handbook* No. 56, 117. [Chem. Warfare, Fed. Civil Defense Admin.]

1159

CAMERON, E. J. **Canned foods in the food protection program.** *J. Amer. Dietetic Assoc.*, 1953, **29**, 670-673. [Nat. Cannery Assoc., Washington, D.C.]

See also Abst. 192.

IMMUNITY

1160

SCAFLEER, J. and BUSSON, A. **Quelques exemples précis d'allergie digestive. [Some clear cases of digestive allergy.]** *Acta gastro-enterol. belg.*, 1953, **16**, 510-513. *Proc.* [Paris.]

THERAPEUTIC AND PREVENTIVE DIETETICS**GENERAL**

1161

SEBRELL, W. H. (Jr.) **Nutrition research. Potentialities in chronic disease.** *Pub. Health Rep., Washington*, 1953, **68**, 737-741. [Nat. Inst. Health, Pub. Health Serv., Washington, D.C.]

1162

GIBBS, C. C. A. **Nutrition in hospital catering.** *Proc. Nutrit. Soc.*, 1953, **12**, 195-198. [King Edward's Hosp. Fund, London Sch. Hosp. Catering, St. Pancras Hosp.]

1163

SMITH, E. B., WOLLAEGER, E. E. and VICTOR, M. **Tolerance to nasogastric tube feedings. A comparative clinical study of two dietary formulas.** *Arch. Int. Med.*, 1953, **91**, 721-728. [Mayo Found., Rochester, Minn.]

The literature shows great variation in the com-

position of fluids recommended for tube feeding, without much evidence on their merits or demerits in use. Owing to the frequent occurrence of diarrhoea among patients receiving a standard tube-fed diet which had been in use in the Mayo Clinic for 5 years, a test was made with 74 patients, mostly with brain lesions, over a period of 7 months in which alternate patients received the standard mixture or a differently proportioned but isocaloric one, both by nasogastric drip under standardised conditions. The standard mixture contained, in g., evaporated skimmed milk 1000, skimmed milk powder 200, egg yolks 100, sugar 100, salt 3.5, with water and a vitamin supplement and supplied, in g., protein 158, fat 34 and carbohydrate 305, of which 204 was lactose. The alternative contained, in g., whole milk 1000, skimmed milk powder 90, whole eggs 200, Dextrin-Maltose No. 1, 100, 20 per cent. cream 200, salt 3, with the vitamin supplement, and supplied, in g.,

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protein 98, fat 103 and carbohydrate 205, of which 104 was lactose. Both had a total volume of 1500 ml., supplying 2150 Cal. per 24 hr.

Of 30 patients on the alternative, only 3 had diarrhoea; of the 27 who did not, 10 had had it previously when on the standard diet. Of 44 patients on the standard mixture, 17 had diarrhoea, and it was concluded that this far outweighed any possible advantage of the higher protein content of this diet. It is not clear whether the poor tolerance is due to its high protein or high carbohydrate content, to the large amount of lactose, or to the unbalanced proportions of the constituents.

W. M. Deans.

1164

ELLIOTT, J., GRIFFITHS, J. J., SMITH, D. W., LEWIS, G. T. and FERRO, P. V. **Continuous enteral feeding and its importance in protein metabolism of the sick.** *Southern Med. J.*, 1953, **46**, 572-578 (with discussion 578). [Med. Res. Found., Dade County, Miami, Fla.]

The increased protein requirement in illness is discussed and the difficulty of supplying it by intermittent feeding. A method was developed by which a sterile solution of enzymic protein digests with added soluble carbohydrates was administered by continuous drip through a plastic tube of outside diameter 2 mm. The tube was passed through the nose into the upper intestinal tract and was well tolerated by patients. A brief analysis is given of results with 869 patients, showing the value and applicability of the method. The inclusion of vitamins in the sterile solution is not recommended; they should be given separately when required.—A. M. Copping.

1165

SHITERI, P. K. and HIGHLAND, G. P. **Excretion and retention of two modified gelatins in normal human beings.** *J. Appl. Physiol.*, 1953, **5**, 814-820. [Surg. Res. Unit, Brooke Army Med. Centre, Fort Sam Houston, Tex.]

In the search for a gelatine which in solution would not gel at ordinary temperatures and could therefore be used in the field for treatment of casualties, 2 materials were tested. Oxypolygelatine was prepared by the method of Campbell *et al.* (*Texas Rep. Biol. Med.*, 1951, **9**, 235) and is liquid in 5 per cent. solution in 0.9 per cent. NaCl solution at room temperature. A "fluid gelatine" was prepared by treating gelatine with a dicarboxylic acid anhydride under specified conditions of pH and temperature. This is liquid in 3 per cent. solution in 0.7 per cent. NaCl solution at room temperature. When 500 ml. of these solutions were infused during 1 hr. into men convalescing from minor burns at the end of 6 hr. the "fluid gelatine" gave significantly greater plasma retention and smaller urinary excretion than the oxy-

polygelatine. With both materials the greatest urinary excretion occurred within 6 hr. from the start of infusion. Gelatine in plasma or urine was measured by estimating hydroxyproline after hydrolysis with 6N HCl in a sealed tube at 150° C.

W. Godden.

1166

GRÖLLMAN, A. **The use of oral fat preparations in medicine.** *J. Clin. Nutr.*, 1953, **1**, 302-305. [Dept. Exp. Med., Southwestern Med. Sch., Univ. Texas, Dallas.] Spanish summary.

An account is given of the fat emulsions now available commercially which have found application in clinical practice.—J. S. Thomson.

1167

STARE, F. J., WADDELL, W. R. and GEYER, R. P. **Clinical uses of fat emulsions.** *Practitioner*, 1953, **170**, 411-418. [Dept. Nutr., Harvard Sch. Pub. Health, Mass.]

A review.

1168

MÜLLER, K. and TÄUFEL, K. **Zur Veränderung von Traubenzucker- und Invertzuckerlösungen bei der Erhitzung (Sterilisation). [Changes in dextrose and invert sugar solutions on heating (sterilisation).]** *Biochem. Ztschr.*, 1953, **324**, 221-227. [Inst. Ernährungsforsch., Potsdam, Rehbrücke.]

Tests by paper chromatography of dextrose and invert sugar solutions sterilised for intravenous use showed that reversion took place in the fructose fraction of the invert sugar but not in the dextrose solution. In the chromatogram of Calorose preparations (invert sugar), 3 ketose-containing, non-reducing reversion products with different R_F values were visible. Comparative chromatographic experiments showed that when fructose solutions were heated, different kinds of reversion products were produced, according to the experimental conditions. From the R_F values these might be mainly difructose-dianhydrides. The reversion products seem to be stable, and to undergo no change in the storing of Calorose.

M. B. Richards.

1169

TALBOT, N. B., CRAWFORD, J. D. and BUTLER, A. M. **Homeostatic limits to safe parenteral fluid therapy.** *New Engl. J. Med.*, 1953, **248**, 1100-1108. [Burnham Mem. Hosp. Child., Massachusetts Gen. Hosp., Boston.]

1170

STEYN, D. G. **Modern trends in pharmacology and therapeutics in relation to nutrition.** *S. African Med. J.*, 1953, **27**, 741-747. [Dept. Pharmacol., Pretoria.]

1171

KREIMER, A. YA. Tkanevaya terapiya ikroi ryb. [Tissue therapy with fish roe.] *Klin. Med., Mosk.*, 1952, **30**, 88-89. [Krivolutsky Bol'nitsy Aleksandrovsk. Raion., Tomsk. Oblast.]

Subcutaneous injections of preparations of roe from white fish, perch or pike, with or without penicillin, appear to have a beneficial effect on patients suffering from certain tissue diseases, particularly bronchial asthma, even when the illness has lasted a long time and has not been amenable to treatment by other methods. Good results have been obtained also with patients suffering from trophic ulcers or inflammations of the female sexual organs.—W. Hughes.

See also Absts. 725, 1426.

DIABETES

1172

TRAVIA, L. Alimentazione e diabete. [Nutrition and diabetes.] *Quad. Nutrizione*, 1952, **12**, 61-118 (with discussion 119-139). *Proc. [Ist. Clin. Med. Gen., Univ. Rome.]*

1173

SINDONI, A. (Jr.), GERBER, P., BOVE, F. and ZIBOLD, L. Compatible hyperglycemia. *Amer. J. Digest. Dis.*, 1953, **20**, 157-178. [Gen. Hosp., Philadelphia, Pa.]

The senior author's system of combining clinical and laboratory findings so as to allow a post-prandial blood sugar level between 170 and 240 mg. per 100 ml. if this is compatible with the patient's wellbeing is considered in detail (see Abst. 3500, Vol. 16). Data obtained from 2 groups each of 100 patients are given in full, and they support the conclusion that such hyperglycaemia is not necessarily harmful and may even be protective. The latter part of the paper is of the nature of a review article on arteriosclerosis, the state of the islets of Langerhans and retinopathy in diabetes, with a concluding section on the general interpretation of the disease. There is a bibliography with 113 references.—D. Harvey.

1174

HARWOOD, R. Management of diabetes in the office and at home. *Geriatrics*, 1953, **8**, 311-323. [Diabetes Clin., Massachusetts Gen. Hosp., Boston.]

1175

NEY, G. J. The juvenile diabetic. A survey of recent literature. *Arch. Pediat.*, 1953, **70**, 175-184. [New York Med. Coll.]

1176

KIRTLEY, W. R., WAIFE, S. O. and PECK, F. B. Effect of glucagon in stable and unstable diabetic patients. *Proc. Soc. Exp. Biol. Med.*,

1953, **83**, 387-389. [Lilly Res. Labs., Indianapolis, Ind.]

1177

SAITO, T. The effect of dietary treatment on insulin sensitivity in diabetes mellitus. *Tohoku J. Exp. Med.*, 1953, **57**, 403-407. [Med. Clin., Tohoku Univ., Sendai.]

1178

AARSETH, S. Cardiovascular-renal disease in diabetes mellitus: a clinical study. *Acta med. scand.*, 1953, **146**, Suppl. 281, pp. 252. [Dept. 7, City Hosp., Oslo.]

This paper gives a very full report on the literature and a critical analysis of the author's findings for 312 diabetic patients admitted to hospital during a period of 29 months with a total of 389 admissions. The patients were fully examined both clinically and biochemically. The associated conditions studied included diabetic retinitis, which was related to the duration of the diabetic state; hypertension, which had been present before the onset of diabetes in over 50 per cent. of the patients and which, in females, was associated with obesity but not with high blood cholesterol; diseases of the heart, especially coronary disease; arteriosclerosis, in which condition X-ray examination of the legs and pelvis was extensively used; renal disease, with special emphasis on inter-capillary glomerulosclerosis; neuropathies; and *necrobiosis lipoidica*.—L. Wills.

See also Abst. 188.

GASTRO-INTESTINAL CONDITIONS

1179

ALESSANDRINI, P. Direttive dietetiche nelle gastropati. [Diet instructions in stomach disease.] *Quad. Nutrizione*, 1952, **12**, 285-335. *Proc.*

1180

GIRDANY, B. R. Peptic ulcer in childhood. *Pediatrics*, 1953, **12**, 56-61. [Dept. Paediat., Sch. Med., Univ. Pittsburgh, Pa.] Spanish summary.

In 45 children between the ages of 14 months and 11 years, 25 girls and 20 boys, the diagnosis of peptic ulcer was made on clinical and radiological grounds. Recurrent pain was usual, but 4 children complained of vomiting only. Emotional disturbances were often present. It is suggested that peptic ulcers are frequent in childhood and that there is probably a strong psychogenic element in their causation.—M. S. Fraser.

1181

ILLINGWORTH, C. F. W. Peptic ulceration. *Proc. Nutrit. Soc.*, 1953, **12**, 148-153. [Dept. Surg., Univ. Glasgow.]

1182

- ZETZEL, L. **Treatment of peptic ulcer.** *New Engl. J. Med.*, 1953, **248**, 976-981; 1015-1021. [Harvard Med. Sch., Boston, Mass.]
A review with 161 references.

1183

- KOSKINEN, P. En metod att neutralisera magsaftens saltsyra. [A method of neutralising the hydrochloric acid of gastric juice.] *Nord. Med.*, 1953, **50**, 1140-1142. [Med. Klin., Turku Univ., Åbo.] English summary.
Caramels made with dried milk and alkali were found more effective than the usual alkali powders.
I. Leitch.

1184

- LEVIN, M. B. and GWYNN, B. A. **Therapy of gastro-duodenal ulcerations.** *Amer. J. Digest. Dis.*, 1953, **20**, 187-194. [Baltimore, Md.]

Estimation of the percentage of meat fibre digested by examination of stools as a diagnostic measure and reduction and control of meat digestion as a therapeutic measure in peptic ulcer patients are described.

The treatment outlined consists in the use of antidiigestant and antispasmodic drugs and control of diet. Recommended are 3 meals a day, plenty of animal protein and non-insistence on mincing or puréeing of all foods.—F. C. Aitken.

1185

- FRADKIN, W. Z. **The dietary treatment of diarrheal diseases.** *Amer. J. Digest. Dis.*, 1953, **20**, 208-210. [Brooklyn, N.Y.]

A diet is described which is recommended for use in the treatment of diarrhoea.

The beneficial effect of carob flour in the treatment of diarrhoea in adults was demonstrated in studies of 50 patients. Tests on 3 patients showed that its ingestion did not interfere with absorption of antibiotics.—F. C. Aitken.

1186

- FORTIER, DE LA B., LEBEL, G. and FRÉCHETTE, A. La thérapeutique des diarrhées infantiles et la farine de caroube. [Treatment of infantile diarrhoea with carob meal.] *Laval méd.*, 1953, **18**, 745-759. [Hôp. Enfant-Jésus, Quebec.]

During 1950 to 1952, 253 infants with diarrhoea, 75 per cent. of them below the age of 7 months and 16 per cent. newborn, were treated with a preparation of carob meal (Arobon, Nestlé); no other treatment was given. All patients with diarrhoea, including severely toxic and complicated cases, were treated. The total mortality was 9.09 per cent. Of the 23 fatal cases, 12 died after the cessation of treatment from complications such as mastoid disease and congenital heart

disease; of the other 11 fatal cases, 4 were excluded from consideration, death being due to causes other than the diarrhoea; the remaining 7 died with toxic signs, but in only 3 was the diarrhoea not controlled. Formed stools were obtained in a mean time of 1.8 day, but to prevent relapse it was generally necessary to continue treatment for from 6 to 8 days, when the carob meal could be replaced by other foods.—L. Wills.

1187

- BULLA, G. La farina di carote nel trattamento delle dispepsie ed enteriti del lattante. [Carrot meal for treating dyspepsia and enteritis of infants.] *Lattante*, 1953, **24**, 173-174. [Brefotrofio Provinciale, Catania.] English summary.

Sixty children aged from 20 days to 18 months, suffering from gastro-intestinal disturbances, were satisfactorily treated with carrot meal as 7 per cent. of Elonac (Soc. Guigoz) in water. The preparation was given as the only nourishment for from 24 to 48 hr. at the rate of from 150 to 200 ml. per kg. bodyweight, after which the amount was gradually reduced and normal food was restored.

E. M. Hume.

1188

- VACHON, A. and LEJEUNE, E. Les stéatorrhées gastro-intestinales en dehors de la sprue. [Gastro-intestinal steatorrhoea other than sprue.] *Gastroenterologia*, 1953, **80**, 101-128. [Lyons.]

A general article in which the classification, diagnosis, and treatment of gastro-intestinal steatorrhoea other than sprue are discussed with reference both to the literature and to the authors' cases. Certain signs and symptoms are grouped together as being common to all types of fatty diarrhoea.—L. Wills.

1189

- VAN DE KAMER, J. H., WEIJERS, H. A. and DICKE, W. K. **Coeliac disease. 4. An investigation into the injurious constituents of wheat in connection with their action on patients with coeliac disease.** *Acta paediat.*, 1953, **42**, 223-231. [Central Inst. Nutrit. Res. T.N.O., Utrecht.] French, German and Spanish summaries.

See also Title 5091, Vol. 23.

1190

- FRAZER, A. C. L'effet du gluten chez les enfants atteints de coeliakie. Est-ce une réaction allergique? [Effect of gluten on children with coeliac disease. Is it an allergic reaction?] *Acta gastro-enterol. belg.*, 1953, **16**, 491-494. *Proc.* [Birmingham.]

1191

- PORGES, O. **The analysis of dietetic treatment of constipation.** *Amer. J. Digest. Dis.*, 1953, 20, 205-207. [Chicago, Ill.]

See also Abst. 1091.

THYROID DISEASE

1192

- KELLY, F. C. **Studies on the stability of iodine compounds in iodized salt.** *Bull. World Health Organiz.*, 1953, 9, 217-230. [Chilean Iodine Educat. Bur., London.] French summary.

The chief conditions which adversely affect the stability of I in salt are moisture, light, heat, impurities and acidity. If the salt mass is not dry the iodide may migrate from one area in the container to another and even into the fabric of the container if that is made of absorbent material. Lacquered tins with impervious linings are suitable for storage of iodised salt. Exposure to sunlight is accompanied by loss of I if the salt is treated with iodide, but not with iodate. Exposure to heat has the same effect if the salt is neutral or acid, but if it is made slightly alkaline with NaHCO_3 or treated with iodate no loss occurs. Currents of air, the presence of impurities and storage under acid conditions all cause loss of I. Salt treated with iodide if dry, free-running, packed in lined impervious cartons, and kept in a cool place and away from strong light, does not lose I and the iodide does not redistribute itself in the mass. In areas where a crude, moist, impure, unprocessed salt is used, treatment with iodate is recommended. Such a product is in use in Mexico.

B. W. Simpson.

1193

- KIMBALL, O. P. **History of the prevention of endemic goitre.** *Bull. World Health Organiz.*, 1953, 9, 241-248. [Doctors' Clin., 12,337 Cedar Rd., Cleveland, Ohio.] French summary.

1194

- MATOVINOVIĆ, J. **The problem of goitre prevention in Yugoslavia.** *Bull. World Health Organiz.*, 1953, 9, 249-258. [Clin. Int. Med., Fac. Med., Zagreb.] French summary.

A region of endemic goitre in Yugoslavia extends from the north-west to the south-east of the country. Statistics are scarce and many are inaccurate but with several interruptions an investigation of incidence has been made since 1923. About 1,400,000 people suffer from the disease. Iodised salt is most urgently needed for prophylaxis. Yugoslavia requires 197,500 tons of salt annually. Salt works in Bosnia produce 68,000 tons, of which only 18,000 tons are iodised,

and the marine salt works supply 62,500 tons, none of which is iodised.—B. W. Simpson.

1195

- NICOD, J. L. **Le goitre endémique en Suisse et sa prophylaxie par le sel iodé. [Endemic goitre in Switzerland and its prophylaxis by iodised salt.]** *Bull. World Health Organiz.*, 1953, 9, 259-273. [Inst. Anat. Pathol., Univ. Lausanne.] English summary.

Recruitment statistics from 1900 to 1925 showed a high incidence of goitre among men from certain regions of Switzerland. Among schoolchildren and hospital patients the incidence was also high. Improvement in the general hygiene of the people was followed by reduced incidence but the decrease was most marked when in 1922 iodised salt was introduced. By 1950 only one canton did not use it, and this region had the highest rate of discharge from the army for goitre. By 1946 no person under 35 years of age had nodular goitre. The dose recommended as optimum was 5 mg. KI per kg. salt, but because of changes in moisture content and conditions of storage there was variation in the intake and as a rule less was consumed. The amount, however, was effective and no harmful effect was noted. The addition of iodate instead of iodide or more efficient desiccation of the salt is recommended.

B. W. Simpson.

1196

- WESPI, H. J. **Jodprophylaxe und Jodmangel. Untersuchungen über die Schilddrüsenverhältnisse bei Schulkindern in einigen Schweizer Dörfern. [Iodine prophylaxis and iodine lack. Investigation of the state of the thyroid gland among schoolchildren in certain Swiss villages.]** *Schweiz. med. Wochenschr.*, 1953, 83, 452-458. [Geburtshilf.-Gynäkol. Abt., Kantonsspital, Aarau.]

Iodisation of salt was introduced in Canton Aarau in 1952 and an examination was made of the schoolchildren as a base line for future comparisons on the effect of iodine treatment. In some of the villages examinations had been made 20 and 40 years ago. Children in certain other villages, including some in Canton Zürich where iodised salt had been used for 20 years, were examined also because the incidence of goitre there was very high or very low. The figures are set out and show that, even without I prophylaxis, there has been a gradual fall in incidence of goitre, due probably to improvement in the standard of living, but that where I prophylaxis has been practised for a number of years the reduction of goitre has been much greater. Since, however, there are still those who deny that I lack is the cause of goitre, the evidence in support of that hypothesis is marshalled.—E. M. Hume.

N.A. and R., January 1954

1197

KOPF, H. Für und wider die Jodierung des Kochsalzes. [For and against iodisation of table salt.] *Wien. klin. Wochenschr.*, 1953, 65, 537-540. [Chirurg. Abt., Krankenhaus Barmherz. Schwestern, Linz.]

A comparison is made of the goitre problem over the last 30 years in Switzerland and Austria. In Switzerland iodised salt has been available at the same price as non-iodised salt; in Austria after 1933 it cost more and prophylaxis by means of it very nearly ceased. The almost complete control of goitre in Switzerland is compared with the high incidence reported at different times and places in Austria. The optimum dose and mode of action of iodine, and the varying incidence of hyperthyroidism and neurosis in areas that had or had not received iodised salt, are discussed. The effect of a water supply with a high iodine content is illustrated by reference to the low incidence of goitre in schoolchildren in Bad Hall neighbourhood. Finally, it is claimed that by the use of iodised salt Swiss children have become bigger and more intelligent.—L. Wills.

1198

LAROCHE, G., TRÉMOLIÈRES, J. and VICHNESKY. Enquête sur l'endémie goitreuse. (Département du Lot). [Inquiry on endemic goitre. (Department of Lot).] *Bull. Inst. nat. Hyg., Paris*, 1953, 8, 445-448.

From 4 areas in the Department of Lot 1013 girls and 741 boys between the ages of 7 and 18 years were examined. The 4 areas were of different geological formation, but no significant difference was noted in percentage incidence of goitre. The overall incidence was 37.9 per cent. among girls and 32.1 per cent. among boys. [It has not been possible to reconcile these figures with the data reproduced.]—B. W. Simpson.

1199

RAMALINGASWAMI, V. The problem of goitre prevention in India. *Bull. World Health Organiz.*, 1953, 9, 275-281. [Nutrit. Res. Labs., Indian Counc. Med. Res., Coonoor, S. India.] French summary.

Goitre, deaf-mutism and cretinism are prevalent in the northern regions of India from the North-West Frontier through Kashmir, Nepal, Bihar and Assam to Burma. The etiology of goitre in these regions is complex and bacterial pollution of drinking waters, excessive intake of Ca, faulty and unbalanced diets may all play their part. In India it is difficult to iodise the coarse crystalline salt obtained by solar evaporation of brine and to stabilise its I under the conditions of humidity and heat which prevail. Indian food habits also

entail loss of I, since salt is not usually taken separately but only added to the food during cooking.—B. W. Simpson.

1200

STACPOOLE, H. H. Prophylaxis of endemic goitre in Mexico. *Bull. World Health Organiz.*, 1953, 9, 283-291. [Nat. Campaign against Endemic Goitre, Mexico.] French summary.

The results of a goitre survey in 8 states of Mexico are discussed. Areas of goitre endemicity were first located and then prophylactic measures were undertaken where possible. All the states bordering the Pacific were implicated, and mid-central and southern parts were also affected. The incidence of goitre was 19 per cent. in more than 1 million persons examined. Fifty-three per cent. of all the cases were slight, 33 per cent. were more than slight, 12 per cent. had large and obvious goitres and 2 per cent. had huge goitres. Cretinism, imbecility and deaf-mutism, as well as other defects, were also frequently encountered in the endemic areas.

Iodised salt containing 1.5 part of KI per 100,000 parts of salt was recommended by the authorities, but the total amount of such salt produced in the country is insufficient for the requirements. Iodised sweets given to 50,000 schoolchildren resulted in a drop of 16 per cent. in incidence. In 1952 the impure moist salt of the district was impregnated with iodate by hand spraying. This product was found to be stable and was successfully used in one village.—B. W. Simpson.

1201

SCRIMSHAW, N. S., CABEZAS, A., CASTILLO, F. and MÉNDEZ, J. Effect of potassium iodate on endemic goitre and protein-bound iodine levels in school-children. *Lancet*, 1953, 265, 166-168. [Inst. Nutrit. Central America and Panama, Guatemala.]

The present study was designed to test the effectiveness of KIO₃ in reducing the incidence of goitre in schoolchildren in an area of high endemicity. The children were 5 to 14 years old; 811 attended 2 rural schools in El Salvador and 197 attended a school in Guatemala. An initial examination showed a goitre incidence of 34 to 57 per cent. The children were divided into 3 groups: one group received tablets containing glucose only, the second group tablets containing 6.5 mg. KI and the third group tablets containing 8.5 mg. KIO₃, which supplied 5 mg. of I weekly, equivalent to the amount ingested when salt is iodised at the level of 1 in 10,000 parts.

During the first 15 weeks, the number of goitres increased by 6 per cent. in the control group, but was reduced by 40 per cent. in the second and by

44 per cent. in the third group. A second trial which lasted 20 weeks showed a similar drop in the incidence of goitre among the children treated with I. At the end of an interval of 16 weeks with no treatment the incidence of goitre had returned to its original value. Renewal of the treatment again reduced the incidence. The necessity for continuous treatment in these areas was realised.

The protein-bound I level of some children in the control group was 2.68 $\mu\text{g.}$, in the KI group 4.97 and in the KIO_3 group 5.1 $\mu\text{g.}$ per 100 ml. There was a definite increase in the treated children over the controls, but no significant difference was found between the group treated with KI and that with KIO_3 .

The conclusion is drawn that KIO_3 given by mouth is a suitable prophylactic for endemic goitre and has several advantages over KI, e.g., greater stability in the presence of impurities and moisture. The need for continuity of the treatment in an endemic area is stressed.

B. W. Simpson.

1202

SALAZAR NORIEGA, S. T. Bocio endémico en el Perú. [Endemic goitre in Peru.] *Rev. Fac. Farm. Bioquim.*, Lima, 1952, 14, 79-85.

In this brief extract from a thesis on endemic goitre in Peru, some numerical data are given. Estimations of total plasma I in 110 normal persons gave averages of 10.13 $\mu\text{g.}$ per 100 ml. on the coast and 7.96 on the Sierra. For 81 goitre patients the averages were 7.46, 9.04 and 5.95 for men, women and children, respectively. In the goitrogenic zones 50 to 60 per cent. of the schoolchildren were affected, and 70 to 80 per cent. of those rejected for military service suffered from physical defects or congenital abnormalities attributable to goitre. It is probable that the incidence of goitre in Peru is 10 times greater than was indicated by the census of 1940. The highest incidence was of diffuse goitre.—M. B. Richards.

1203

GREENWALD, I. Cabbage and turnips as a cause of endemic goiter. *J. Clin. Endocrinol.*, 1953, 13, 882. *Proc.* [Dept. Chem., Coll. Med., Univ. New York.]

See also Abst. 157.

ANAEMIA

1204

SMITH, N. J. and ROSELLO, S. Iron deficiency in infancy and childhood. *J. Clin. Nutr.*, 1953, 1, 275-286. [St. Christopher's Hosp. Child., Philadelphia, Pa.] Spanish summary. The signs, etiology and treatment of Fe deficiency anaemia in childhood are discussed. The

essay is illustrated by clinical and laboratory studies of 162 children with this condition, 87 per cent. of whom were under 4 years of age, and 147 of whom were found to have an inadequate intake of Fe.—M. S. Fraser.

1205

ZURUKZOGLU-SKLAVOUNOU, S. Hypochrome Anämie im Kindesalter. Studie auf Grund von 373 Fällen. [Hypochromic anaemia in childhood. Study based on 373 cases.] *Helv. paediat. Acta*, 1953, 8, 251-275. [Kinderklin., Univ. Zürich.] French, Italian and English summaries.

The findings are reported in detail and confirm the work of other authors. In the present series one-third of the children were mentally retarded or showed degenerative stigmata, malformations, hydrocephaly or cerebral paralysis. Serum Cu was high in two-thirds of the 30 in which it was estimated. [The diets of the children are not described.]—L. Wills.

1206

EVANS, G. E. and WALTMAN, R. The use of intravenous saccharated oxide of iron in obstetrics and gynecology. *Amer. J. Obstet. Gynecol.*, 1953, 66, 118-123. [Dept. Obstet. Gynaecol., Coll. Med., State Univ. New York.]

Treatment with a preparation of saccharated oxide of Fe, given in the form of 5 intravenous injections on alternate days and with a total equivalent to 500 mg. Fe, was found to raise Hb values in most patients. There were few and trivial untoward reactions.—A. M. Thomson.

1207

JOHNSON, A. C. Iron equilibrium. Clinical observations on nutritional anemia. *Amer. J. Digest. Dis.*, 1953, 20, 179-182. [Corvallis, Oreg.]

1208

FLEISCHHACKER, H. Zur Therapie der Asiderosen. [Treatment of iron deficiencies.] *Wien. klin. Wochenschr.*, 1953, 65, 264-268. [Evangelisches Krankenhaus Innere Erkrank., Vienna.]

1209

COHEN, I. Post-partum megaloblastic anaemia. *S. African Med. J.*, 1953, 27, 627-630. [Dept. Med., Univ. Witwatersrand, Johannesburg.]

Megaloblastic anaemia was diagnosed by sternal marrow biopsy in 5 Bantu women 3 months after the birth of their infants. Two responded to vitamin B_{12} and 3 to folic acid; all but one were able to breast feed their infants.—F. C. Aitken.

N.A. and R., January 1954

1210
WITTS, L. J. **Haemopoiesis in relation to disorders of the alimentary tract.** *Gastroenterologia*, 1953, **79**, 322-325 (with discussion 325-327). *Proc.* [Oxford.]

1211
BADENOGH, J. and RICHARDS, W. C. D. **The gastric lesion in anaemia with particular reference to biopsy.** *Gastroenterologia*, 1953, **79**, 329-336 (with discussion 337). *Proc.*

1212
GERLICH, N. Methionin bei der Blei-Anämie. [Methionine for lead anaemia.] *Arch. exp. Pathol. Pharmacol.*, 1953, **218**, 139-140. *Proc.* [Bielefeld.]

See also Absts. 843, 1108, 1109.

OTHER CONDITIONS

1213
ROLLAND, C. F. **Anorexia nervosa.** *Proc. Nutrit. Soc.*, 1953, **12**, 153-156. [Dept. Therap., Royal Infirmary, Edinburgh.]

1214
WISSMER, B. Le traitement des maigreurs constitutionnelles. [Treatment of constitutional leanness.] *Arch. Mal. Appar. digest.*, 1953, **42**, 149-157. [Geneva.]

1215
POMERANZE, J. **Etiology and treatment of atherosclerosis.** *Geriatrics*, 1953, **8**, 359-369. [New York Med. Coll.]

1216
Low cholesterol diet in the treatment of atherosclerosis. *Amer. J. Med.*, 1952, **12**, 357-365. [Cornell Univ. Med. Coll., New York.]
Report of a conference.

1217
LOWRY, M. L., MOORE, R. W. and CAILLIET, R. **Adenosine-5-monophosphate in the treatment of multiple sclerosis.** *Amer. J. Med. Sci.*, 1953, **226**, 73-83. [Dept. Pharmacol., Med. Sch., Univ. S. California.]

1218
PERERA, G. A. **Depressor effects of potassium-deficient diets in hypertensive man.** *J. Clin. Invest.*, 1953, **32**, 633-636. [Dept. Med., Coll. Phys. Surg., Columbia Univ., New York.]

Observations are reported on 4 patients with hypertensive vascular disease to whom diets containing 20 to 23 m. equiv. K daily, between $\frac{1}{3}$

and $\frac{1}{4}$ of the normal intake, were given. Not later than 48 hr. after and often within 24 hr. of the diet change there was a small but significant decrease in "resting" blood pressure. Urinary K fell and there was also a decrease, which was more marked, in urinary Na. The diet was, however, unpalatable and, in respect of protein, unbalanced and its use for longer than 3 to 9 days might have had dangerous complicating effects. The observations point again to a relation between certain cations and the hypertensive state.
D. Harvey.

1219
MEILMAN, E. **The medical management of arterial hypertension.** *New Engl. J. Med.*, 1953, **248**, 897-902; 936-943. [Dept. Med., Beth Israel Hosp., Boston, Mass.]
A review with 222 references.

1220
DUNCAN, G. G. and GILL, R. J. **The management of essential hypertension.** *New Engl. J. Med.*, 1953, **249**, 85-90. [Dept. Med., Jefferson Med. Coll., Philadelphia, Pa.]
A lecture report.

1221
SCHEMM, F. R. **The management of congestive heart failure.** *Geriatrics*, 1953, **8**, 334-340. [Montana Deaconess Hosp., Great Falls.]

1222
GREPPI, E. and BONGINI, O. Diete ristrette nella profilassi e nella cura delle malattie pletoriche. [Restricted diets in the prevention and treatment of plethoric disorders.] *Quad. Nutrizione*, 1952, **12**, 161-230. *Proc.* [Ist. Clin. Med. Gen., Univ. Florence.]

1223
ODENTHAL, H. and HAASE, J. Therapeutisch-klinische Untersuchungen über die Behandlung chronischer Nierenerkrankungen mit salzloser, eiweissreicher Diät. [Therapeutic-clinical studies of the treatment of chronic kidney disorders with a saltless diet rich in protein.] *Deutsch. Arch. klin. Med.*, 1953, **200**, 86-122. [Med. Klin., Univ. Bonn.]

Twenty-four patients with chronic kidney disorders of different types, on a diet restricted in fluid and salt, were given for some weeks a protein supplement of 150 to 200 g. Aletosal, a low-salt dried milk containing protein 25, fat 27, lactose 40 and minerals 4.5 per cent., including 0.2 per cent. salt. Individual details of blood pressure, fluid balance and albumin in urine, residual N, xanthoproteins and uric acid in blood, and serum protein fractions are tabulated.

The protein supplement had no significant effect on blood pressure, diuresis, albuminuria or subjective symptoms. There was little change in the xanthoprotein content of the blood; uric acid was reduced but residual N rose in some. Changes in protein fractions in blood were slight, and total serum protein rose only in patients whose past circumstances pointed to protein underfeeding. The general conclusion was that treatment with a low-salt, low-fluid, high-protein diet is suitable for patients with negative N balances, and can safely be used even when there is slight renal insufficiency.

W. M. Deans.

1224

LECLERC, H. Le chou adjuvant du traitement des cirrhoses et des néphrites. [**Cabbage in the treatment of cirrhosis and nephritis.**] *Presse méd.*, 1953, **61**, 886.

1225

GRAFE, E. Die Gicht. [**Gout.**] *Deutsch. med. Wochenschr.*, 1953, **78**, 867-871. [Würzburg.]
A review.

1226

MUGLER, A. La diététique du gouteux. [**Dietetics of gout.**] *Presse méd.*, 1953, **61**, 967. [Vittel.]

1227

HARVEY, H. I. and SIMMONS, W. D. **Weight reduction: a study of the group method: preliminary report.** *Amer. J. Med. Sci.*, 1953, **225**, 623-625. [Herrick Mem. Hosp., Berkeley, Calif.]

Good results were obtained with group treatment of about 100 obese women in 8 groups, irrespective of whether the group emphasis was nutritional or psychological. Blood lipid and other nutritional studies will be reported later.

W. M. Deans.

1228

OPITZ, H. El problema de la obesidad infantil. [**The problem of obesity in children.**] *Rev. española Pediat.*, 1953, **9**, No. 50, Extraord.,

369-378. [Heidelberg.] English, French and German summaries.

1229

BROSIN, H. W. **The psychology of overeating.** *New Engl. J. Med.*, 1953, **248**, 974-975. *Proc.* [Dept. Psychiat., Sch. Med., Univ. Pittsburgh, Pa.]

1230

DUBLIN, L. I. **Relation of obesity to longevity.** *New Engl. J. Med.*, 1953, **248**, 971-974. *Proc.* [Metropolitan Life Insurance Co., New York.]

1231

PENNINGTON, A. W. **A reorientation on obesity.** *New Engl. J. Med.*, 1953, **248**, 959-964. *Proc.* [E.I. du Pont de Nemours and Co., Wilmington, Del.]

1232

JOLLIFFE, N. **Obesity—its prevalence, etiology, effects on health, management.** *Proc. Nat. Food Nutrit. Inst.*, December 1952; *U.S. Dept. Agric., Agric. Handbook* No. 56, 73-77 (with discussion 77-79). [Dept. Health, Bur. Nutrit., New York.]

1233

TEILUM, G. **"Collagen diseases."** *Nord. Med.*, 1953, **50**, 1063-1067. [Pathol. Anat. Inst., Univ. Copenhagen.] English summary.
A review.

1234

PATZ, A. **Cataracts in galactosemia. Observations in three cases.** *Amer. J. Ophthalmol.*, 1953, **36**, 453-462. [920 Paul Street (2), Baltimore, Md.]

Published cases of high blood galactose are tabulated. Three infants are described in which the lens opacities regressed and development became normal when a galactose-free diet was given. On this diet the children were subsequently maintained satisfactorily.—E. M. Hume.

See also Absts. 1092, 1094, 1095, 1139, 1140.

6. FEEDING OF ANIMALS

GENERAL, INCLUDING DIGESTIBILITY TRIALS

1235

HAMMOND, J. **Education in animal nutrition.** *Proc. Nutrit. Soc.*, 1953, **12**, 178-181. [Sch. Agric., Univ. Cambridge.]

1236

HUFFMAN, C. F. **Ruminant nutrition.** *Annu. Rev. Biochem.*, 1953, **22**, 399-422. [Dairy Dept., Michigan State Coll., East Lansing.]

N.A. and R., January 1954

1237

- JARRIGE, R. L'utilisation des glucides alimentaires par les ruminants. [Utilisation of dietary carbohydrates by ruminants.] *Ann. Nutrit. Alimentation*, 1953, **7**, 339-406. [Inst. Nat. Recherche Agronom.]
A review.

1238

- BALCH, C. C., BALCH, D. A., JOHNSON, V. W. and TURNER, J. Factors affecting the utilization of food by dairy cows. 7. The effect of limited water intake on the digestibility and rate of passage of hay. *Brit. J. Nutrition*, 1953, **7**, 212-224. [Nat. Inst. Res. Dairying, Univ. Reading.]

Six cows were fed on 8.2 kg. alfalfa hay daily. During the experimental periods water intake was limited to 60 per cent. of that taken freely. The intake of hay fell and all cows temporarily lost weight, which was replaced when normal water intake was allowed.

During the period of restricted water intake digestibility of dry matter and crude fibre increased slightly, but this did not affect the intake of apparent digestible energy and starch equivalent, because of the lower intake of hay. The rate of passage of stained hay was little affected by reduced water intake.

Studies of the changes in the rumen and reticulum were made during limited water intake on a cow with a fistula. During this period the dry matter in the digesta was maintained at a constant level and there was an apparent increase in the secretion of saliva, favouring fermentation.

D. M. Walker.

1239

- HEAD, M. J. The effect of quality and quantity of carbohydrate and protein in the ration of the sheep on the digestibility of cellulose and other constituents of the ration, with a note on the effect of adding vitamins of the B-complex on the digestibility and retention of the nutrients of a hay ration. *J. Agric. Sci.*, 1953, **43**, 281-293. [Rowett Res. Inst., Bucksburn, Aberdeenshire.]

Three-year-old Cheviot wether sheep received 500 g. hay daily and a study was made of the effect on the digestibility of cellulose of additions of flaked maize and, if necessary, maize or potato starch to provide half, three-quarters or the full requirement for maintenance of energy and 0.5, 1 and 1.5 times the requirement of protein. At least 94 per cent. of the cellulose in the diets was provided by the hay, the rest by flaked maize.

The digestibility of cellulose assessed by the method of Norman and Jenkins (*Biochem. J.*, 1933, **27**, 818) was depressed by the addition of maize starch or flaked maize, and the addition of

protein had no effect, either because insufficient was given or the protein used was unsuitable. Increase of the intake of N but not of starch increased retention of N. When starch was added to half maintenance requirement with 2.5 to 3.5 times the protein requirement as maize gluten there was still no effect on N balance or on the digestibility coefficients of cellulose or dry matter, but those of other nutrients decreased. In further tests starch was not given or was given at half maintenance level with 0.5, 1.0 or 1.5 times the requirement of protein as white fishmeal or casein. Digestibility of cellulose and dry matter was unaffected by type or amount of protein; that of nitrogenous material was increased by extra protein, especially fishmeal, and decreased by starch, especially potato starch. Retention of nitrogen increased with increased levels of starch or protein.

When urea was added to the diet in N-equivalent amounts, the digestibility of cellulose, dry matter and other nutrients was unaffected by varying the levels of starch and protein, but protein digestion was improved. N retention was poor with diets containing urea but was improved by 1 g. DL-methionine daily.

The addition of B vitamins to a daily diet of 1100 g. hay did not affect digestibility of dry matter or N, or N retention.

It is suggested that growth of micro-organisms responsible for digesting cellulose in the rumen is not dependent on extra N if the substrate they are digesting contains about 1 per cent. N.

V. R. Jackson.

1240

- CARDON, B. P. Influence of a high salt intake on cellulose digestion. *J. Animal Sci.*, 1953, **12**, 536-540. [Dept. Animal Husb., Univ. Arizona.]

Salt at the rate of 1.8 lb. in the ration or 2 lb. as a drench per head daily was given to 3 Hereford cows. The daily ration was 15 lb. alfalfa hay per head. The salt did not affect the digestibility of cellulose, which was about 55 per cent.

Experiments *in vitro* confirmed these findings, and the addition of 3.3 per cent. molar phosphate buffer solution was also without effect on digestibility.—T. D. Bell.

1241

- KENDALL, K. A., TOUCHBERRY, R. W., NEVENS, W. B. and OVERMAN, O. R. The apparent digestibility of nitrogen as associated with calcium fertilization of the soil. *J. Animal Sci.*, 1953, **12**, 635-641. [Dept. Dairy Sci., Univ. Illinois.]

Experiments with rabbits showed that the apparent digestibility of N compounds in lespedeza

hay and wheat grain was significantly higher when the crops were grown on plots which had received Ca as well as a fertiliser containing P and K.

The apparent digestibility of N compounds was significantly higher in lespedeza hay cut early than in that cut 3 weeks later.—D. M. Walker.

1242

STEWART, J. **Grazing habits and trace elements.** *Brit. J. Animal Behaviour*, 1953, **1**, 116-117. [Moredun Inst., Edinburgh.]

1243

BOURNE, R. F. **Trace minerals in animal nutrition—cobalt.** *North Amer. Vet.*, 1953, **34**, 546-548. [Fort Collins, Colo.]
A short review.

1244

BELL, J. M. **Cobalt feeding experiments in Western Canada.** *Brit. Agric. Bull.*, 1953, **6**, 148-152. [Dept. Animal Husb., Univ. Saskatchewan, Saskatoon.]

1245

HARVEY, J. M. **The nutritive value of some Queensland fodders.** *Queensland J. Agric. Sci.*, 1952, **9**, 169-184. [Biochem. Sect., Chem. Lab., Div. Plant Indust.]

The chemical composition and digestibility of a variety of cereal grains and by-products, roughages, protein concentrates and the leaves of edible trees were estimated with Merino wethers in metabolism crates. The results are presented in detail.—P. C. Jowsey.

1246

ACCARDI, F. Indagine sul valore nutritivo del trifoglio alessandrino (*Trifolium alexandrinum* L.) in coltura asciutta. [Nutritive value of berseem clover, *Trifolium alexandrinum*, L., in dry culture.] *Zootec. Vet.*, 1953, **8**, 207-216. [Ist. Zootec. Gen., Univ. Palermo.] English and German summaries.

The nutritive value and digestibility of berseem grown in the hot dry climate of Sicily were estimated with 6 mature dairy cows. The clover was the last cut of the season, and 7 samples were analysed, giving the following composition: crude protein 15.75 to 19.68, ether extract 2.64 to 4.13, crude fibre 29.16 to 32.81, N-free extract 39.00 to 43.92, ash 7.22 to 9.92 per cent. of dry matter. The average dry matter was 17.92 per cent. Digestibility coefficients were: crude protein 66.94 to 70.01, ether extract 47.63 to 50.84, crude fibre 49.79 to 52.93, N-free extract 68.29 to 71.43. The nutritive value was 0.52 feed unit per kg. dry matter.—T. D. Bell.

1247

BROZZETTI, P. Il fieno dei prati-pascoli dei Monti Sibillini. Composizione, digeribilità e valore nutritivo. [Hay from the pastures of Monti Sibillini. Composition, digestibility and feeding value.] *Riv. Zootec.*, 1953, **26**, 212-217. [Ist. Zootec. Gen., Univ. Perugia.]

The pastures of the Monti Sibillini are uncultivated and although some hay is made in the early summer they are for the most part intensively grazed by flocks brought on to them for the season. The pastures are very rich and produce excellent meat and milk for cheesemaking. Hay was cured in the field in 5 areas, and a composite sample, considered to be representative, was analysed and used in digestibility trials with 2 rams. The results showed good digestibility, composition and feeding value compared with values reported by other authors for hay from mountain pastures.

T. D. Bell.

1248

McCULLOUGH, M. E., BAIRD, D. M., NEVILLE, W. E. (Jr.) and SELL, O. E. **The intake, digestibility, and nutrient deficiencies of seven Southeastern hays.** *J. Dairy Sci.*, 1953, **36**, 854-858. [Georgia Exp. Stat., Experiment, Ga.]

The digestibility of 7 locally grown hays was estimated with yearling Guernsey heifers with chromic oxide as indicator. No hay provided enough total digestible nutrients, largely because of low digestibility. Protein was supplied in adequate amounts by only 2 of the hays; the other 5 were just below Morrison's standard.

D. M. Walker.

1249

DAS, B. K. and MUKHERJEE, N. C. **The nutritive value of the indigenous grasses of Assam. 6. The grass Joy-joha (*Ischaemum rugosum* Salisb.) as a cattle feed.** *Indian J. Vet. Sci.*, 1952, **22**, 239-246. [Animal Nutrit. Res. Scheme, Gauhati.]

Joy-joha was cut at the flowering stage and given as green fodder for 31 days to 4 Assamese bullocks of average weight 570 lb. Excreta were collected during the last 10 days. Dry matter consumption was on the average 1.89 lb. per 100 lb. bodyweight, which showed that the fodder was highly palatable. Digestibility coefficients were: dry matter 58, crude protein 62, ether extract 71, crude fibre 63, N-free extract 59 and total carbohydrates 60. A similar procedure was followed with hay made on the tripod system from the grass cut at the same stage of growth. It was less palatable. Digestibility coefficients were, in the same order: 52, 42, 55, 66, 49 and 56. The results of chemical analyses are presented in detail. At the flowering stage the green fodder contained 7.13 per cent.

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crude protein on a dry matter basis. Digestible protein and starch equivalent were, respectively, 1.25 and 10.88 lb. per 100 lb. fresh matter. The hay contained 6.63 per cent. crude protein on a dry matter basis and the digestible protein and starch equivalent were, respectively, 2.4 and 26.7 lb. per 100 lb. hay.

The animals showed positive balances of Ca and P when given the green fodder. With hay a positive Ca balance was not always found, but P was adequate.—P. C. Jowsey.

1250

DEV GOSWAMI, H. N. **Food problem of cattle in Assam.** *Indian Farming*, 1953, 3, 22–24. [Animal Nutrit. Res. Scheme, Assam, Gauhati.]

1251

ROBERTS, L. P. **Bact. coli as a food supplement.** *Nature*, 1953, 172, 351–352. [Evans Biol. Inst., Runcorn, Cheshire.]

A strain of *Bacterium coli* from a collection of calf scour strains was cultured in a synthetic medium containing ammonia and glucose; 100 litres yielded about 400 g. bacterial protein ($N \times 6.25$).

When groups of young rats fed to appetite on a basal diet with 11.5 per cent. protein, consisting of barleymeal 2 parts, bran 1 part, with 0.5 per cent. cod liver oil, were given supplements of 5 per cent. *Bact. coli* protein or 5 per cent. fishmeal protein, the increases in weight gains were equal and significant.

When chickens on a basal ration with 11.9 per cent. protein, consisting of barleymeal, bran, 2 per cent. grassmeal and 0.5 per cent. cod liver oil were given supplements of bacterial protein or fish solubles, growth rate was grossly subnormal, but with both 5 per cent. bacterial protein and 1 per cent. fish solubles, growth rate in the first 4 weeks of life was significantly better than that of controls given fishmeal plus fish solubles and equal to that of controls on a commercial chick mash. The optimum percentage of bacterial protein is not known but is thought to be considerably below 5 per cent. but greater than 1 per cent.

The economic possibilities are indicated and it is suggested that *Bact. coli* protein might be used in the rations of other farm animals.

W. M. Deans.

1252

ROBERTS, R. S. **The use of bacteria as a food supplement.** *Vet. Rec.*, 1953, 65, 573. [Evans Biol. Inst., Runcorn, Cheshire.]

In experiments similar to the above, rats given a supplement of 1.0 to 1.56 per cent. "coliform protein" showed growth equal to that of controls given rat cubes prepared according to the formula of the Medical Research Council.

Baby pigs were given the basal diet used for chicks with 2 per cent. coliform protein added and gained on the average 7.2 lb. in 14 days. On the basal diet alone the average gain was 5.2 lb.; the difference was statistically significant.

P. C. Jowsey.

See also Absts. 162-4, 193, 717.

HORSES

1253

SAIGIN, I. A. O putyakh razvitiya kumysnogo proizvodstva. [Methods of developing koumiss production.] *Konevodstvo*, 1953, No. 1, 44. [Bashkir. Opyt. Stantz. Zhivot.]

Medicinal properties are not confined to the koumiss (fermented mare's milk) obtained from the steppe breeds. During the 6 to 7 months of lactation, purebred mares of the Bashkir or Kazakh breeds produce 2500 litres of milk. Their foals should be restricted to from 1200 to 1400 litres from the age of 2 to 3 months in order to train them to use pasture, and the rest of the milk should be turned into koumiss.

E. W. Birse.

1254

SYRESIN, I. Izo opyta kormleniya zherebtsov proizvoditelei drozhzhevannykh kormom. [An experiment in feeding stud stallions on fermented fodder.] *Konevodstvo*, 1953, No. 4, 18–24. [Kalyzhskii Goskonyush.]

Experiments in which the test group of stallions had part of their fodder fermented by a method described by Levitskii (Abst. 1351, Vol. 22) showed that this treatment improved their general condition and sexual potency as determined from semen characteristics and the foals of mares served by these stallions. The increase in weight of the test group during the 63 days of the experiment was 18.5 per cent. greater than that of the control group. The fermented fodder improved their general digestion.—W. Hughes.

CATTLE

GROWTH AND FATTENING

1255

- ASKER, A. A. and RAGAB, M. T. **Causes of variation in birth weight of Egyptian cattle and buffaloes.** *Indian J. Vet. Sci.*, 1952, **22**, 265-272. [Dept. Animal Breeding, Fac. Agric., Fouad I Univ., Cairo.]

1256

- Calf rearing.** *Minist. Agric. Fish. Bull.* No. 10, May 1953, pp. 28. H.M.S.O. London. Price 1s. 3d. net.

1257

- MOODY, E. G., LUNDQUIST, N. S. and HAUGE, S. M. **Response of calves to a chromatographed milk.** *J. Dairy Sci.*, 1953, **36**, 603. *Proc.* [Purdue Univ., Lafayette, Ind.]

1258

- THOMAS, J. W. and OKAMOTO, M. **The production of a magnesium deficiency in the young calf using a semi-synthetic milk diet.** *J. Dairy Sci.*, 1953, **36**, 591. *Proc.* [Bur. Dairy Indust., U.S. Dept. Agric.]

1259

- LAMBERT M. R., JACOBSON, N. L., ALLEN, R. S. and ZALETEL, J. H. **Lipid requirements of the young dairy calf.** *J. Dairy Sci.*, 1953, **36**, 391. *Proc.* [Iowa State Coll., Ames.]

1260

- JOHNSON, B. C., HOPPER, J. H. and GARDNER, K. E. **The use of various fats in "filled milk" diets for the production of veal calves.** *J. Dairy Sci.*, 1953, **36**, 599. *Proc.* [Univ. Illinois, Urbana.]

1261

- GULLICKSON, T. W., ADAMS, R. S., GANDER, J. and SAUTTER, J. H. **Vegetable oils versus butterfat in the diet of dairy calves.** *J. Dairy Sci.*, 1953, **36**, 599-600. *Proc.* [Univ. Minnesota, St. Paul.]

1262

- YOUNG, F. B. **Response of dairy calves to whole milk replacements containing dried whey product, dried skim milk and fat.** *J. Dairy Sci.*, 1953, **36**, 600. *Proc.* [Iowa State Coll., Ames.]

1263

- STEIN, J. F., KNOTT, C. B. and ROSS, E. B. **Use of special processed soybean oil meal in feeds for young dairy calves.** *J. Dairy Sci.*, 1953,

36, 600. *Proc.* [Pennsylvania State Coll., State College.]

1264

- HANSSON, A. **Samspelet mellan arv och uppfödningens intensitet när det gäller nötkreaturens tillväxt, mjölkavkastning och livslängd. [The interaction between heredity and plane of nutrition during rearing with reference to the growth, milk yield and life span of cows.]** *Kgl. Lantbruksakad. Tidskr.*, 1953, **92**, 85-98. English summary.

Three preliminary experiments are briefly sketched, which were designed to investigate the effect of plane of nutrition during early growth on the variables listed. These experiments showed that plane of nutrition affected chiefly the speed of growth. From this result it is deduced that longevity should be found with a low-plane rather than a high-plane system. Intensive feeding appeared to have little effect on milk yield. As a consequence of these experiments, which also suggested that heredity had a considerable effect on these variables, a more detailed study, using 16 pairs of identical twins, was made.

The design of this experiment is described in detail. One twin of each pair was fed on a standard according to its age and growth capacity. The pairs were divided into 4 groups of 4 and the other twin of each pair (the experimental animal) was allowed 60, 80, 120 or 140 per cent. of the control twin's diet up to 25 months of age, and after that the same diet as the control. The feed intake was averaged monthly, as was the body-weight, and graphs and tables give the feed intake and growth over chosen periods, as well as growth per feed unit eaten. The first conclusions to be made are drawn from Fig. 3. These are that the young animal has a high growth capacity, so that the rate of growth can be influenced by feeding. If in any early age interval the animal is given plenty of food and grows well, then in the next interval the capacity for growth will be reduced. From this and previous experiments it is suggested that, within the limits of plane of nutrition in this experiment, heredity and not intensity of feeding determines the bodily development at maturity.

Growth was divided into 3-monthly periods and an analysis of variance made on log growth. This was used to confirm the results above. Again the author reasons that "growth passes without detectable break into senescence", implying that the length of life is to a great extent influenced by the supply of food. "We have therefore shown that a low plane of nutrition delays development and increases length of life in as widely separated

organisms as uni-cellular organisms, insects, frogs, fishes, mice and rats." The conclusions on length of life in cows, as far as can be decided from the paper, are based on a selected sample.

In the next stage of the study the growth per feed unit was investigated. It is shown clearly that growth per feed unit decreases with age, in a similar fashion for the different planes of nutrition. Fig. 5 shows the growth in g. per feed unit averaged over the 24-month experimental period plotted against plane of nutrition. There is a negative linear relation, from which it is reasoned that utilisation of feed depends on the plane of nutrition. In an attempt to explain this relation, a digestibility trial was made from 21 to 24 months of age. Table 5 shows similar digestibility coefficients in all groups, leading to the reiteration that the utilisation of digested feed must be affected by plane of nutrition. An analysis of variance is carried out similar to that on log growth, and is used to support the conclusions above. [Between experimental groups *P* should be 0.05, and also 0.05 between twin pairs (heredity).]

Frequency of respiration and heart rate were recorded for half the animals from the 10th to the 25th month and the figures given showed both variables to increase as the plane of nutrition rose.

Milk yield was next investigated, and it was concluded that a certain negative relation exists between the plane of nutrition and the future milk yield. The author here inserts a caveat concerning the extent of the data, obtained from 30 first or second lactations, and because the rations of the high-plane cows had been abruptly reduced to those of the controls.—A. W. Boyne.

1265

DAHMEN, J. J. and BOGART, R. **Some factors affecting rate and economy of gains in beef cattle.** *Oregon Agric. Exp. Stat. Tech. Bull.* No. 26, July 1952, pp. 23. [Corvallis, Oreg.]

Seventy-four individually-fed beef calves were studied in 2 groups. One group of 25 purebred Hereford and Angus calves of both sexes were born during the first half of 1949 and were fed over the following winter and spring. The second group, consisting partly of purebred Hereford and Angus bulls and heifers and partly of grade Hereford steers and heifers, were born during the 1950 spring and summer and were fed over the following winter and spring. The results showed that bulls were much more efficient feed converters than heifers, and also made an average daily liveweight gain of 2.3 lb. compared with 2.0 lb. for heifers. The age at slaughter was found to be significantly related to birthweight; the higher the birthweight the sooner the animal reached slaughter weight, but no relation was found between suckling gains and gains in the feed lot.—E. L. B. Haskew.

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1266

HIBBS, J. W., POUNDEN, W. D. and CONRAD, H. R. **A high roughage system for raising calves based on the early development of rumen function. 1. Effect of variations in the ration on growth, feed consumption, and utilization.** *J. Dairy Sci.*, 1953, **36**, 717-727. [Ohio Agric. Exp. Stat., Wooster.]

Jersey and Holstein calves were used in 2 experiments to find the effect on cost and efficiency of feed utilisation of varying a basic high-roughage ration.

In the first experiment a simple grain concentrate mixture containing 14.5 per cent. total protein was compared with a complex mixture containing 25 per cent. total protein. In both rations the ratio of hay to grain was 2 : 1. In the second experiment the effect of giving whole milk for 7 to 9 weeks with or without a vitamin B₁₂ supplement and using a 4 : 1 hay : grain ratio was studied. The performance of calves given the 2 : 1 and 4 : 1 hay : grain ratios was also compared. In both experiments the calves were inoculated with fresh cud taken from older cattle.

Under the conditions of these experiments there was no difference in growth between calves given simple and complex grain mixtures. Efficiency of feed utilisation was affected by the kind of hay; calves given high quality alfalfa hay gained more efficiently and at lower cost than calves given a mixture of alfalfa and timothy hay. The calves on the 2 : 1 hay : grain ratio had a higher efficiency of feed utilisation than those on the 4 : 1 ratio. There was no advantage in giving a vitamin B₁₂ supplement.—J. N. Aitken.

1267

CONRAD, H. R. and HIBBS, J. W. **The effect of rumen inoculations and the ratio of hay to grain eaten on digestion and nitrogen retention in high roughage fed calves.** *J. Dairy Sci.*, 1953, **36**, 600-601. *Proc.* [Ohio Agric. Exp. Stat., Wooster.]

1268

GARDNER, K. E. and STUFF, G. S. **Roughage : concentrate ratios for young dairy calves.** *J. Dairy Sci.*, 1953, **36**, 601. *Proc.* [Univ. Illinois, Urbana.]

1269

LA SSITER, C. A., DENTON, T. W. and BASTIN, G. M. **The value of certain surfactants as growth stimulants when fed to calves.** *J. Dairy Sci.*, 1953, **36**, 592. *Proc.* [Univ. Kentucky, Lexington.]

1270

VOELKER, H. and JACOBSON, N. L. **Effects of various antibiotics and a detergent and of**

frequency of milk replacement feeding on young dairy calves. *J. Dairy Sci.*, 1953, **36**, 592-593. *Proc.* [Iowa State Coll., Ames.]

1271

KON, S. K., OLIVER, J., PORTER, J. W. G. and RIDLER, B. The effect of aureomycin and penicillin on the growth of calves. *Proc. Nutrit. Soc.*, 1953, **12**, x. [Nat. Inst. Res. Dairying, Univ. Reading.]

1272

BLOOM, S. and KNOTT, C. B. Aureomycin supplementation of rations for dairy calves. *J. Dairy Sci.*, 1953, **36**, 633-636. [Pennsylvania Agric. Exp. Stat., State College.]

Aureomycin in the form of a supplement or as crystalline aureomycin hydrochloride was incorporated in the milk replacement and/or calf starter ration of 6 groups of 6 male Holstein calves. The experimental design was such as to allow a comparison of 6 practical feeding methods. There was no significant difference in rate of weight gain or efficiency of feed utilisation.—J. N. Aitken.

1273

BARTLEY, E. E., FOUNTAINE, F. C. and ATKESON, F. W. Effect on growth of feeding aureomycin to dairy calves from birth to thirteen months of age. *J. Dairy Sci.*, 1953, **36**, 604. *Proc.* [Kansas State Coll., Manhattan.]

1274

RUSOFF, L. L., FUSSELL, J. M., HYDE, C. E. and CROWN, R. M. Oral supplementation versus intramuscular injection of aureomycin to young calves. *J. Dairy Sci.*, 1953, **36**, 593. *Proc.* [Louisiana State Univ., Baton Rouge.]

1275

RICHARDSON, C. W., RONNING, M., BEROUSEK, E. R. and NORTON, C. L. The effect of aureomycin upon the growth of dairy calves when administered orally, subcutaneously and intramuscularly. *J. Dairy Sci.*, 1953, **36**, 593. *Proc.* [Oklahoma Agric. and Mech. Coll., Stillwater.]

1276

CLAWSON, G. R., MUSGRAVE, S. D., NORTON, C. L. and GALLUP, W. D. Alfalfa vs. prairie hay for calves with and without aureomycin supplement. *J. Dairy Sci.*, 1953, **36**, 594. *Proc.* [Oklahoma Agric. and Mech. Coll., Stillwater.]

1277

HIBBS, J. W. and CONRAD, H. R. The effect of feeding aureomycin supplement on the performance of calves raised on the high roughage

diet. *J. Dairy Sci.*, 1953, **36**, 593-594. *Proc.* [Ohio Agric. Exp. Stat., Wooster.]
See Abst. 1266, Vol. 24.

1278

ROLLINSON, D. H. L. A comparison of the effects of phenothiazine dosage with and without a mineral lick supplement on indigenous calves in Uganda. *J. Comp. Pathol.*, 1953, **63**, 159-170. [Animal Health Res. Centre, Entebbe, Uganda.]

Over a 34-week period groups each of 7 grazing calves were given phenothiazine monthly, phenothiazine monthly and a mineral lick, or a mineral lick, or were untreated. Growth was not significantly improved by phenothiazine alone but was by phenothiazine and minerals and, to a less extent, by minerals alone. Worm egg counts were highest in the mineral group and significantly lowest in both phenothiazine groups, the controls being intermediate. There was little group difference in blood inorganic P estimated on 3 occasions, though the mineral group mean was highest each time and the phenothiazine group lowest. Compared with controls the minerals-only group was significantly lower in Hb and cell volume and the phenothiazine group significantly lower in Hb only.—W. Thomson.

1279

HEWITT, A. C. T. Beef cattle research in Victoria. *J. Dept. Agric., Victoria*, 1953, **51**, 289-296; 315-318; 323.

This study is part of the national investigation of beef production in Australia (see Absts. 3028, Vol. 22; 3641, 3644, Vol. 23). The management and progress of 2 farms in Victoria are described. On one Herefords are reared entirely on pasture, and on the other Aberdeen-Angus are given hay when pasture is considered inadequate. Details are given of the cattle reared and slaughtered from 1948 to 1951.—T. D. Bell.

1280

ALLDEN, W. G. Have beef cattle a place on Lower North farms? *J. Dept. Agric. S. Austral.*, 1953, **56**, 438-442.
A symposium.

1281

LANDREY, J. S. A. Fattening of young oxen at Vaalhartz. *Farming in S. Africa*, 1953, **28**, 149-152; 168. [Vaalhartz Exp. Stat.]

1282

BAGLINA, A., HERNÁNDEZ, A., FERNÁNDEZ N., E. and ALBORNOZ B., A. Algunas consideraciones sobre el problema ganadero en Chile.

N.A. and R., January 1954

[The cattle problem in Chile.] *Zootechnia*, 1953, 2, 164-174. English and French summaries.

See also Absts. 320, 325.

MILK PRODUCTION

1283

KAJANOJA, P. Über die Einwirkung der Unterernährung auf die Milchproduktion der frischmelkenden Kühe. [Effect of underfeeding on milk production of cows in early lactation.] *Acta agral. fenn.*, 1944, 56, No. 3, pp. 132.

The experiments reported in detail here were made during the years 1936 to 1938 and 1940 to 1941. Newly calved cows were placed on experiment from the day of calving. The rationing was by one of two plans. In the first, the cows were given a ration providing an energy intake considerably lower than that necessary to supply the requirement for the expected yield of the cow. After the yield of milk had become stable, the energy intake was increased gradually until it supplied an amount adequate for the expected milk yield. In the second, the cows started on an adequate ration, then, in a second period, had the energy intake considerably reduced and in a third period had it restored. Similar trials in which the protein intake was altered and the energy intake kept adequate were made with other cows. The length of all periods had to be short, 2 to 3 weeks, and in order to allow for this and for individual variation between cows with respect to feed requirements and utilisation, 27 cows were used in the energy intake trials and 24 in the protein intake trials. The results are submitted in detail, and the following is a brief summary of the findings.

A cow receiving less energy in its ration than that required for its milk-producing capacity gives a low yield, which, however, is higher than that calculated from the energy intake; the balance of the energy it takes from its body fat reserves. Thus in the first experiments the average daily milking capacity of the cows was 18.16 kg. daily and the energy intake was adequate only for 13.83 kg. The average actual yield was 16.44 kg. The cows therefore produced on the average 2.61 kg. from their body reserves, the total milk yield falling below capacity by only 1.72 kg. The milk produced at the expense of body fat was equivalent to about 65 per cent. of the deficiency of energy intake. With greater feed deficiency both the milk produced at the expense of body fat and the difference between expected and actual yield increased, but a smaller percentage of the latter deficiency was made up at the expense of body fat. When the feed (energy) supply to an undernourished cow was increased, the effect on milk yield was seen within 4 to 5 days. Its effect,

depending upon the intake, was (1) to increase milk yield, (2) to limit production of milk at the cost of body fat or (3) to increase body fat. This third effect came into force only if the extra intake was more than adequate to meet the requirements for (1) and (2). In some cases the milk produced at the expense of body fat reached considerable amounts. Thus with 6 cows on inadequate energy intake 6 kg. milk daily or 400 kg. in all were produced during an experimental period of several weeks. These and other results in the literature suggest that milk production at the expense of body fat may amount to 10 to 20 kg. daily or a total of 600 to 900 kg. On the other hand, temporary undernourishment for short periods (up to 2 weeks) may not affect total milk yield to any appreciable extent over a whole lactation. Undernourishment of newly calved cows may cause a rise in the percentage of fat in the milk, but has no appreciable effect on its protein content.

With newly calved cows it would appear that the protein supply can be materially lower than the standards generally recommended without the lack of protein acting as a limiting factor in milk production. If the quantity of digestible pure protein for maintenance is estimated at 75 g. for each feed unit (Scandinavian) necessary for maintenance and if 30 to 40 g. is provided for each kg. milk there is no certain reduction of milk production. If the production protein supply falls below 30 g. per kg. milk, then milk yield may fall by 0.5 to 1 kg. daily. A very low protein intake reduces the fat content of the milk, but has no perceptible influence on the protein content. After a period of very low protein feeding the effect of extra protein intake on the milk yield becomes noticeable in about 6 days.

The findings reported are in accord with those reported by other workers. In such experiments where the protein intake was only equivalent to that required for maintenance and 1.2 to 1.3 times the amount present in the milk, yield was normal over long periods, sometimes the whole lactation, and the cows remained in normal health. Protein supplied in more than standard allowances did not increase milk yield; abundant excess tended to reduce it.—W. Godden.

1284

FINSTAD, K. Beitet på Apelsvoll. [The Apelsvoll pastures.] *Tidsskr. norske Landbruk*, 1953, 60, 53-81.

A detailed account is given of the management and use of pasture at this research station from 1946 to 1950. Fertiliser was increased experimentally up to a maximum above which the computed yield of feed units per unit area could not be raised. At the maximum, the milk cows on

the heavily fertilised area were producing 50 per cent. more milk over the year, per unit area, than the average for the whole area.—I. Leitch.

1285

HEWITT, A. C. T. **Dairy cattle feeding trials. Concentrates v. no concentrates.** *J. Dept. Agric., Victoria*, 1953, **51**, 193–200; 229–232.

Feeding trials were made over 3 years on 3 farms in each of 4 areas of Victoria. One of these areas is dealt with in some detail. The farms were all devoted to pasture for milk production. On each farm no concentrates were given in one year, high-protein concentrates at the rate of about 1000 lb. per cow per year in another, and low-protein concentrates at the same rate in the third. The use of concentrates increased the yield of milk and butterfat, but the cost far exceeded the returns from the increased production. The treatments did not affect the health of the animals, which was at all times good.—T. D. Bell.

1286

FRENS, A. M. **Dairy-cattle feeding problems and their study in the Netherlands.** *Nederlands Melk Zuiveltijdschr.*, 1953, **7** (Special issue), 95–103. [State Agric. Exp. Stat., Hoorn.]

1287

CABRERA, J. I. and RIVERA-BRENES, L. **The value of grass silage for feeding dairy cows in Puerto Rico.** *J. Agric. Univ. Puerto Rico*, 1953, **37**, 59–73. [Dept. Animal Husb., Agric. Exp. Stat., Univ. Puerto Rico, Rio Piedras.] Spanish summary.

A series of trials were made to compare the value of different silages and freshly cut grasses for milk production. The grasses used were Merker grass (*Pennisetum purpurascens*, var. Merkerii) at early and mature stages, and Para grass (*Panicum purpurascens*) ensiled with 5 or 10 per cent. molasses, and ensiled whole immature sugar cane. The trials extended over 3 years, and milk production was recorded for comparable groups of cows receiving concentrates at the rate of 4 lb. per gallon. Proximate analysis of the roughages are reported.

Silages were superior to freshly cut grass, except for Para grass silage with 5 or 10 per cent. molasses, which was not so good as freshly cut mature Merker grass. Merker-kudzu silage was only equal to freshly cut Merker grass. Sugar cane silage was excellent.—T. D. Bell.

1288

SMITH, S. E., LENGEMANN, F. W. and REID, J. T. **Block vs. loose salt consumption by dairy cattle.** *J. Dairy Sci.*, 1953, **36**, 762–765. [Dept. Animal Husb., Cornell Univ., Ithaca, N.Y.]

The consumption of salt in loose or block form by lactating cows grazing 3 types of pasture was measured. In 2 out of 3 summer seasons the cows consumed more loose than block salt. Salt consumption was greater on Kentucky bluegrass and white clover pasture than on ladino clover and orchard grass or alfalfa, ladino clover and brome-grass.—J. N. Aitken.

1289

BASTIN, G. M. and SEATH, D. M. **The effects of adding ground hay to dairy cattle rations.** *J. Dairy Sci.*, 1953, **36**, 580. *Proc.* [Univ. Kentucky, Lexington.]

1290

GRAF, G. C. and ENGEL, R. W. **The value of corn cobs as a partial replacement for hay in the ration of lactating cows.** *J. Dairy Sci.*, 1953, **36**, 580–581. *Proc.* [Virginia Polytech. Inst., Blacksburg.]

1291

HILL, D. L., HATCHER, B., LUNDQUIST, N. S. and CROWL, B. W. **Corn cobs and Purdue cattle supplement A as a ration for dairy cattle.** *J. Dairy Sci.*, 1953, **36**, 581. *Proc.* [Purdue Univ., Lafayette, Ind.]

1292

KING, W. A. and LA MASTER, J. P. **Blackstrap molasses for feeding dairy cattle.** *J. Dairy Sci.*, 1953, **36**, 580. *Proc.* [Clemson Agric. Coll., S.C.]

1293

MATHER, R. E. **Babassu meal in rations with and without molasses for milk production.** *J. Dairy Sci.*, 1953, **36**, 580. *Proc.* [New Jersey Agric. Exp. Stat., Sussex.]

1294

MAGRUDER, N. D. and KNOTT, C. B. **The utilization and value of ammoniated industrial by-products as sources of nitrogen for dairy cattle.** *J. Dairy Sci.*, 1953, **36**, 581–582. *Proc.* [Pennsylvania State Coll., State College.]

1295

MØLLENBACH, C. J. and LARSEN, L. H. **Fodringsforsøg med mask og ensilage og undersøgelser over spaedborns tolerance for den ved disse forsøg producerede mælk. [Feeding experiments with brewer's grains and silage and studies of the tolerance of infants for milk produced with these.]** *Forsøgslab. København Beretn.*, 1953, No. 266, pp. 36.

Regulations for the feeding of cows producing milk for children have been in force in Denmark

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since about 1880. They arose from hypothetical reasoning about the poor quality of milk produced by the early co-operative dairies. *Cruciferae* might not be used; not more than 30 kg. roots of the beet family might be given daily; residues such as brewer's and distiller's grains, sugar beet pulp, molasses and mustard seed and rapeseed cakes were forbidden; only 0.5 kg. cottonseed cake daily might be used. These regulations were modified in 1937 and again in 1941 in respect of the use of roots, but the total embargo on brewer's grains and rapeseed and mustard seed cakes remained. The use of silage was restricted. The experiments described here were planned in relation to these decisions.

The experiments were made during 4 winters, 1943 to 1944, 1944 to 1945, 1946 to 1947 and 1949 to 1950. The milk, test and control, was produced by 2 groups of cows on the same farm and distributed from the same dairy to the children's homes.

The first test was concerned with brewer's grains and root top silage. There were 28 cows of average age 5.5 years and 5 months in milk. All had 4 feed units of fodder beet, 2 kg. hay, 4 kg. barley straw and 1 kg. mustard seed cake. Those that gave more than 6 kg. of 4 per cent. milk were given also for each 2.5 kg. of 4 per cent. milk over 6 kg., 1.1 kg. of a mixture of 10 parts mustard seed cake, 10 linseed cake, 5 meat-and-bone meal, 20 ground barley, 25 ground oats and 30 malt sprouts. The test cows had 7.5 kg. brewer's grains instead of 1.65 kg. of that concentrate mixture. This continued from December to April. From 5 April to 30 April the test cows, with 3 replacements, had silage instead of brewer's grains.

There was no difference in bacteriological findings between the groups. On the average the experimental cows produced slightly less dry matter and fat in milk. There was no great difference in vitamin A or carotene content; the silage milk had a little more carotene.

There were 70 control and 87 test children in 6 homes. There was no difference in rate of growth or health as judged by the incidence of normal and abnormal stools.

Two further experiments on the same pattern were concerned with root top silage, and the last with grass silage. The ration with grass silage gave more milk with more vitamin A and carotene than the control. There was no difference between the groups of children in any of the tests.

I. Leitch.

1296

ROOK, J. A. F. **The effect of a high plane of nutrition on the composition of milk.** *Proc. Nutrit. Soc.*, 1953, **12**, viii-ix. [Hannah Dairy Res. Inst., Kirkhill, Ayr.]

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1297

PARMELEE, C. E. and HOLLENDER, H. A. **The effect of some feeds upon the characteristics of the butterfat produced.** *J. Dairy Sci.*, 1953, **36**, 560-561. *Proc.* [Purdue Univ., Lafayette, Ind.]

1298

CHILSON, W. H. and SOMMER, H. H. **A study of milk fat from cows on special roughage diets.** *J. Dairy Sci.*, 1953, **36**, 561. *Proc.* [Univ. Wisconsin, Madison.]

1299

BLOSSER, T. H. and SONI, B. K. **A comparison of the influence of hard water and soft water on the milk production of dairy cows.** *J. Dairy Sci.*, 1953, **36**, 596-597. *Proc.* [State Coll. Washington, Pullman.]

1300

VOELLER, E. H., LUDWICK, T. M., CLIFTON, C. M., DONOHO, H. R. and ELY, F. **A study of lactational differences in butterfat percentage in dairy cattle.** *J. Dairy Sci.*, 1953, **36**, 584-585. *Proc.* [Ohio Agric. Exp. Stat., Wooster.]

1301

THOMAS, J. W. and MOORE, L. A. **Thyroprotein feeding to dairy cows during successive lactations.** *J. Dairy Sci.*, 1953, **36**, 657-672. [Bur. Dairy Indust., U.S. Dept. Agric., Washington, D.C.]

Thyroprotein was given to a group of 20 lactating Holstein and Jersey heifers at the rate of 1.0 or 1.5 g. per hundredweight [? 100 lb.]. Treatment was continued during successive lactations from the 50th day after calving until 90 days before the next expected calving. On the average treatment lasted for about 300 days. Fifteen of the cows completed 2 lactations, 9 completed 3, 4 remained in the herd through 5 and 3 completed 6 lactations. In a control group of 8, 6 cows completed 2 lactations, 5 completed 3, 2 completed 5 and 1 completed 6. During the first lactation 9 treated and 4 control cows received a total digestible nutrient (T.D.N.) intake equal to requirement. The remaining cows in both groups were given T.D.N. at 125 per cent. of requirement. In subsequent lactations all cows were given 125 per cent. of requirement whenever thyroprotein was given. Feed consumption and yields of milk and butterfat were recorded.

There was an immediate increase in yield of milk and butterfat production when thyroprotein was given. The increases were sustained over a longer period when the extra nutrients were given. The total milk yield of the treated cows over any one lactation was not greater than that

of comparable control cows. Cows given thyroprotein lost weight during treatment, but regained it rapidly when thyroprotein was stopped. The feed conversion efficiency of the treated group decreased with each succeeding lactation. Mortality was high among calves from the treated cows.

It was concluded that thyroprotein for long periods during lactation is not desirable.

J. N. Aitken.

1302

SWANSON, E. W. and HINTON, S. A. **The economy of winter feeding thyroactive supplement under a base-surplus marketing plan.** *J. Dairy Sci.*, 1953, **36**, 582. *Proc.* [Univ. Tennessee, Knoxville.]

1303

FINCHAM, R. C. and VOELKER, H. H. **The long-time effects of aureomycin feeding to dairy heifers.** *J. Dairy Sci.*, 1953, **36**, 594. *Proc.* [Iowa State Coll., Ames.]

See also Absts. 337, 1264.

REPRODUCTION

1304

RIGGS, J. K., COLBY, R. W. and SELLS, L. V. **The effect of self-feeding salt-cottonseed meal mixtures to beef cows.** *J. Animal Sci.*, 1953, **12**, 379-393. [Dept. Animal Husb., Texas Agric. Exp. Stat.]

In 1949 to 1950, 35 in-calf Angus, Hereford and Shorthorn cows were divided into 2 groups and wintered on 200 acres of unimproved upland pasture. One group was hand-fed with 2 lb. cottonseed meal per head daily, the other group had free access to a mixture of 15 to 35 per cent.

common salt and 85 to 65 per cent. cottonseed meal. Four groups of 5 in-calf beef cows of mixed breed were wintered over 1950 to 1951, one group with hay and cottonseed to appetite, the other 3 self-fed with cottonseed meal salted enough to limit the intake to about 2 lb. per head daily. A sub-maintenance ration of hay was given to one of these groups, a maintenance ration to another and hay to appetite to the third. Results indicate that a high salt intake had a beneficial effect upon digestibility of all the nutrients, but the use of salt limited the consumption of concentrates accessible to appetite. Provided water was always available and the salt was introduced gradually, a high salt intake appeared to cause no damage to the kidneys, nor to have any detrimental effect on the health or reproductive ability of the cows.—E. L. B. Haskew.

1305

MANN, T. and WALTON, A. **The effect of under-feeding on the genital functions of a bull.** *J. Agric. Sci.*, 1953, **43**, 343-347. [Molteno Inst., Univ. Cambridge.]

After a 5-week preliminary period on a normal ration, a 5-year-old Dexter bull was kept for 23 weeks on a ration which was at first half the normal, and later reduced to starvation level (15 lb. barley straw daily). During this period it lost weight rapidly. It was then returned to the normal ration for 25 weeks and regained weight. The reduced ration did not affect volume or density of semen, or motility or morphology of spermatozoa. The secretory function of the accessory glands was affected; the citric acid and fructose contents of the semen were much reduced, but gradually returned to normal during the recovery period.—T. D. Bell.

SHEEP

1306

THOMSON, W. and THOMSON, A. M. **Effect of diet on milk yield of the ewe and growth of her lamb.** *Brit. J. Nutrition*, 1953, **7**, 263-274. [Rowett Res. Inst., Bucksburn, Aberdeenshire.]

Ewes from a previous experiment (Abst. 2922, Vol. 19), which had been maintained during late pregnancy on high- or low-plane diets, and their lambs, were used. High-plane ewes suckled their own lambs or lambs from low-plane ewes, and low-plane ewes suckled their own or lambs from high-plane ewes. After lambing the ewes all received adequate rations of concentrates, hay and swedes or grass, and lambs had access to concentrates, hay and grass as soon as they would eat them.

The milk yield of the high-plane ewes was about 20 gal. in 13 weeks' lactation, compared with 11

gal. for the low-plane ewes, and the increase in the feed of the latter after lambing did not increase the milk supply quickly enough to be of full benefit to the lambs. In the low-plane ewes udder development was severely retarded, particularly in those bearing twins, and this was reflected in the milk supply and weight increase of the lambs. Lambs transferred to high-plane fostermothers from low-plane mothers benefited from the greater milk supply, though at weaning they had not caught up with those from high-plane mothers. There was a high mortality rate among those transferred from high-plane ewes to low-plane.

It is concluded that undernutrition in late pregnancy greatly affects the size and vitality of the lamb and the milk yield of the ewe, particularly in early lactation.—T. D. Bell.

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1307

- GILL, J. C. and THOMSON, W. **Comparisons between indoor and outdoor feeding experiments with breeding ewes.** *Brit. Agric. Bull.*, 1953, **6**, 154-160. [Rowett Res. Inst., Bucksburn, Aberdeenshire.]

1308

- LEWIS, G. and ALLCROFT, R. **The effect of diet and molybdenum on liver copper storage in stalled sheep.** *Proc. Nutrit. Soc.*, 1953, **12**, ix. [Minist. Agric., Vet. Lab., Weybridge, Surrey.]

1309

- GARRIGUS, U. S., KAMMLADE, W. G., BOLEY, L. E. and HARDENBROOK, H. (Jr.) **A study of elemental sulfur and of some other suggested preventives of enterotoxaemia in a lamb fattening ration.** *J. Animal Sci.*, 1953, **12**, 474-479. [Dept. Animal Sci., Coll. Agric., Univ. Illinois.]

Two series of trials with Western feeder lambs, each lasting for 84 days, are reported. In the first series elemental S did not reduce the efficiency of feed conversion or eliminate losses from enterotoxaemia when added, at the rate of 1 to 2 per cent. of the maize allowance, to a ration of maize, maize silage, soya bean meal and powdered limestone. In the second series, the mean daily weight increment was 0.33 lb. for lambs receiving 1/3 oz. S daily, compared with 0.29 lb. for untreated controls, when both groups daily received 3.7 lb. maize silage, 1.2 lb. corn-and-cob meal, 0.216 lb. soya bean meal, 0.027 lb. iodised salt and 0.027 lb. powdered limestone. The addition of extra cobs to the corn-and-cob meal or of 0.112 oz. NaHCO_3 daily did not influence the rate of gain of other groups in the second series.

A. N. Worden.

1310

- GORB, T. V. and GRISHPAK, V. F. **O kormlenii i soderzhanii karakul'skikh matok na Ukraine. [Feeding and care of karakul ewes in the Ukraine.]** *Karakul. Zverovodstvo*, 1953, **6**, No. 1, 26-33. [Ukrainsk. N.-I. Inst. Zhiot.]

Nutrition tests during different periods of pregnancy were made as follows. Of 4 groups of 53 ewes each, the first and fourth were given regular rations, the first being fed plentifully, the fourth moderately. The second group was fed plentifully for 3 months and then moderately, the third group vice versa. The third group produced the largest number of lambs with good fleeces. The following rations are recommended for pregnant ewes: during the first period 1.5 kg. hay and 0.1 kg. concentrates; during the last 2 months the ration should be increased gradually to 2 kg. hay and 0.2 kg. concentrates. Hay should be

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given 4 times a day, and 0.3 to 0.5 kg. succulent fodder (beetroot) improves the condition of the animals.—E. W. Birse.

1311

- KHAMRAKULOV, D. YU. **Opyt organizatsii kormovoi bazy v karakulevodcheskom sovkhoe "Ulus". [Organisation of the fodder supply on the "Ulus" state karakul farm.]** *Karakul. Zverovodstvo*, 1953, **6**, No. 1, 37-40.

The shortage of fodder, due to the dry climate, was made good by growing suitable plants, such as alfalfa, oats, or perennial ryegrass, so that the state farm is becoming increasingly independent of the weather.—E. W. Birse.

1312

- SLEN, S. B., WHITING, F., PETERS, H. F. and MACNAUGHTON, W. N. **A comparison of certain breeds of range sheep under different environmental conditions.** *Canad. J. Agric. Sci.*, 1953, **33**, 344-353. [Exp. Stat., Lethbridge, Alta.]

The wool and lamb production of 50 Canadian Corriedales and 50 Romnelets (Romney \times Rambouillet) were compared over 3 years on one station and with those of similar groups on a second station 200 miles away, where a group of 50 Rambouillets was included in the study. Highly significant wool differences between stations suggested that environment, including plane of nutrition, was of greater importance than breed differences. The Rambouillet yielded significantly more wool than the other breeds, which did not differ in this respect. Canadian Corriedale lambs were significantly heavier at birth than Romnelet lambs, but at weaning there was no difference. Station differences were significant at weaning only. On a fattening ration daily gain, feed conversion efficiency and dressing percentage were similar for all breeds. Rambouillet carcass grade was inferior to that of the other breeds.

J. C. Gill.

1313

- SLEN, S. B., WHITING, F. and RASMUSSEN, K. **Range sheep production in Western Canada.** *Dept. Agric., Ottawa, Exp. Farms Serv. Publ. No. 886*, March 1953, pp. 48. [Exp. Stat., Lethbridge, Alta.]

1314

- SHELTON, M., HARDY, W. T., WARWICK, B. L., MILLER, J. C. and PATTERSON, R. E. **Skin folds in Rambouillet sheep.** *J. Animal Sci.*, 1953, **12**, 440-450. [Texas Agric. Exp. Stat., Substat. 14, Sonora.]

In a flock of about 200 ewes, divided into 2 groups on the basis of the number of skin folds, the smooth group yielded slightly less grease wool

than the folded, but were superior in staple length and clean wool, and were heavier at weaning and as yearlings. Rams with folded skins had shorter staple length and greater weight of grease wool and bodyweight than smooth rams. The number of skinfolds increased with age.

The ewes were range-fed, and records for 6 years were considered. Variation between years was significant; this was thought to be due to changes in the plane of nutrition. The greater

number of skinfolds in rams compared with ewes was also thought to be due to nutrition, since they were fed better than the ewes on range. In both sexes conformation scores were higher for the smooth types. On the whole the advantages of the smooth types outweighed the slight advantage of the folded in yield of grease wool, and the former should be encouraged in breeding projects.

T. D. Bell.

See also Absts. 323, 387, 853, 930, 949.

PIGS

1315

DYRENDALH, S., SWAHN, O., BJÖRCK, G. and HELLVING, L. **Artificial raising of baby pigs.** *Acta Agric. scand.*, 1953, **3**, 334-354. [Royal Vet. Coll., Stockholm, Sweden.]

The artificial rearing of 52 normal piglets and 40 from dams unable to suckle them is reported. The metal and wooden types of brooders used, with the necessary heating and feeding arrangements, are described. The piglets were put in the brooders at 2 to 3 days of age and transferred to heated pens after 3 weeks. They were fed on a commercial synthetic milk, "Grix", and a commercial pig starter meal, "Trind", the compositions of which are given.

The piglets gained well, and at 56 days weighed 19.6 and 14.4 kg. for normal and "catastrophic" litters, respectively. Feed consumption was 2.5 Scandinavian feed units per kg. liveweight increase.

Essential features for artificial rearing are supply of a palatable milk substitute, heated draught-proof brooders, scrupulous cleanliness and a high-protein meal from 10 to 20 kg. liveweight. The economic aspect of artificial rearing is discussed.—T. D. Bell.

1316

TEBBUTT, N. F. **Rearing orphan piglets with a foster-mother.** *Vet. Rec.*, 1953, **65**, 416. [Oundle.]

The successful rearing of 8 piglets whose dam died immediately after parturition is reported. The piglets were bottle fed for the first day, and then fed from an Arnold stone jar fostermother till the 25th day. The fostermother and teats must be kept absolutely clean by scalding, and the teat holes may have to be enlarged. The milk mixture given is described. After the 25th day it was given in a trough. Since meal consumption was still low at 35 days, the milk was then given after the meal. At 8 weeks the piglets were eating 2 lb. meal and 4 pints of milk mixture; the latter was then gradually discontinued. There was no scouring until the 21st day, and this was quickly controlled. After the addition of penicillin to the

meal, on the 25th day, the piglets made great progress, and at 8 weeks compared favourably with those reared on the same farm in the normal way. The extra labour seemed economically justifiable.—T. D. Bell.

1317

SEWELL, R. F., SHEFFY, B. E., EGGERT, R. G. and LOOSLI, J. K. **Studies on the protein requirement of suckling pigs.** *J. Animal Sci.*, 1953, **12**, 597-604. [Dept. Animal Husb., Cornell Univ., Ithaca, N.Y.]

In 4 trials with suckling pigs taken from their dams after 2 days, the growth rates for 1 month of groups receiving synthetic milk diets containing 16, 20, 24, 28 and 32 per cent. protein on an air-dry basis were compared. Isolated soya bean protein was used in 2 trials, and casein in the others. The higher the protein content, the greater the growth rate and efficiency of feed utilisation. Casein was slightly better than soya protein in promoting growth.

Pigs from the last trial were kept on an adequate ration for a further 3 weeks. The rates of gain were affected by the previous treatment, the pigs on the lower protein levels growing more slowly. The nutritive ratios of the diets, in ascending order of protein content, were: 1:6.5, 1:5.1, 1:4.0, 1:3.3 and 1:2.9. Normal sow's milk has a nutritive ratio of 1:3 or 4, and a protein content of from 29 to 34 per cent.—T. D. Bell.

1318

BARBER, R. S. BRAUDE, R. and MITCHELL, K. G. **Indoor v. outdoor rearing of piglets.** *Proc. Nutrit. Soc.*, 1953, **12**, xiii. [Nat. Inst. Res. Dairying, Univ. Reading.]

1319

DINUSON, W. E., KLOSTERMAN, E. W., LASLEY, E. L. and BUCHANAN, M. L. **Cobalt, alfalfa and meat scraps in drylot rations for growing-fattening pigs.** *J. Animal Sci.*, 1953, **12**, 623-627. [N. Dakota Agric. Coll., Fargo.]

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Four rations were given: a maize and soya bean meal ration alone or with meat scraps or dried alfalfa, or both. Each ration was given alone or with one of the following supplements: cobalt, vitamin B₁₂, cobalt plus vitamin B₁₂, a commercial trace mineral mixture. In all 120 Duroc pigs of average initial weight 54 lb. were used and kept on concrete floors until they reached about 200 lb. liveweight. The results are presented in detail and analysed statistically.

Cobalt increased the rate of gain significantly on all rations and meat scraps increased the rate of gain over that on maize and soya bean meal alone, the increase being greatest with pigs which received cobalt also. Dried alfalfa significantly decreased the rate of gain, irrespective of the supplement.—P. C. Jowsey.

1320

VAN WYK, H. P. D. and VERBEEK, W. A. **Feeding methods to supply protein requirements of growing pigs.** *Farming in S. Africa*, 1953, **28**, 155-156; 158. [Coll. Agric., Potchefstroom.]

An experiment was made to find a practical method of reducing the consumption of protein-rich concentrates by fattening pigs after the period of rapid growth. Large White pigs were fed from 50 to 200 lb. liveweight on yellow maize meal and a protein-rich concentrate of white fishmeal, wheat bran, groundnut cake and alfalfa meal. One group received a mixture of 70 per cent. maize and 30 per cent. protein concentrate, starting with 2 lb. and finishing with 7 lb. per head daily. The other group had 1 lb. protein concentrate daily, the weight of total feed being made up with maize. The groups gained weight (1.50 and 1.54 lb. daily) and graded equally. The carcasses of the restricted pigs had slightly more fat than the others, but not sufficient to affect grading. Both groups were equally efficient in feed conversion (3.16 and 3.15 lb. feed per lb. liveweight increase). The protein provided by the limited ration was adequate, that by the other was excessive, and the difference in protein concentrates used was considerable, 67 lb. as compared with 95 lb. per 100 lb. liveweight increase.—T. D. Bell.

1321

VAN ALBADA, M., UBBELS, P., DAMMERS, J. and FRENS, A. M. **Proefnemingen met varkens en kuikens over de bruikbaarheid van enige producten ter besparing van dierlijke eiwitten (vismee, diersme, enz.) bij de veevoeding. Tweede serie 1951. [Tests with pigs and chicks of the suitability of some products to save animal protein (fishmeal, meatmeal, etc.) in stock feeding. Second series, 1951.]** *Versl. Landbouwk. Onderzoek.*, 1952, No. 58-8, pp. 126. English summary.

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The first 35 pages of this report are devoted to a review of the literature. The trials are a continuation of work already reported (Abst. 1404, Vol. 22). The general plan of the experiments was: a group with the normal amount of animal protein (positive control); one with about one-quarter of that amount of animal protein (negative control); one or more given the test product in addition to protein as in the negative control or occasionally in the normal ration. With the chickens there were sometimes also groups with half normal animal protein or groups with little or none. The positive controls had Dutch freshwater fishmeal or Norwegian herring meal.

The products tested were: whale solubles; U.S. Industrial Chemicals vitamin B₁₂ concentrate, 12 mg. per kg., high in protein and B complex generally; a vitamin B₁₂ product of the Centrale Suiker Maatsch., Amsterdam, containing 5 mg. per kg.; Eiwitkern-Trouw, also an Amsterdam product, a soya bean meal, processed and with vitamin B₁₂ added, 0.9 mg. per kg.; Grastell condensed fish solubles, an English product; Norwegian condensed fish solubles.

The pig trials were made independently at 5 centres, with in all 200 young pigs, from an initial weight of 15 to 20 kg. to a slaughter weight of 55 to 60 kg. The results are described in detail and set forth in 10 tables including the statistical summary with English and Dutch legends.

The meal mixtures used were more complex than those used in 1950 and more attention was paid to the amino-acids supplied, so that there was less difference than in 1950 in respect of methionine and lysine between positive and negative controls. The importance of the nutritional history of the pigs was obvious. Two centres had to buy in some pigs for the experiments and only there was there a significant difference between positive and negative controls. Dutch freshwater fishmeal was as good as Norwegian herring meal, and there was no advantage in adding fish press juice to a normal ration where any important difference between positive and negative controls existed. Vitamin B₁₂ alone could not replace the absent protein.

The chick trials were at 6 centres with 85 pens and 4475 chicks in all. Again the results are set out in detail for each centre separately and summarised. Twelve preparations, vitamin B₁₂ concentrates, fish or whale concentrates or whey products, were tested. The differences produced were small and of little or no practical importance. All market samples of fish solubles were not of equal value. Norwegian condensed fish solubles improved a ration with Dutch fishmeal or Norwegian herring meal; the American vitamin B₁₂ concentrate improved herring meal only. It is suggested that, if attention is paid to amino-acids

in the basal ration and the feeding technique is good, special supplements to "save" animal protein are not required by chicks.—I. Leitch.

1322

SMITH, D. M. **Two feeds per day enough for pigs receiving separated milk.** *N.Z. J. Agric.*, 1953, **87**, 31. [Dept. Agric., Ruakura Animal Res. Stat.]

1323

POIJÄRVI, I. Beiträge zur Verdauung und Verwertung von Holzzellulose beim Schwein. [Digestion and utilisation of wood cellulose by pigs.] *Acta agral. fenn.*, 1944, **57**, No. 1, 1-53. Finnish summary.

Digestibility trials with adult pigs in which different wood celluloses were used showed wide differences in the results obtained from individual pigs and also in those obtained with the different cellulose preparations. On an average the pigs digested 40 to 50 per cent. of the organic matter of celluloses prepared by the sulphite process. Celluloses from alder or birch woods gave digestibility coefficients of 70 to 80 per cent. and even more; values of 71 to 97 per cent. were obtained for a sulphite cellulose from aspen wood. Fineness of grinding did not appear to affect digestibility but strong chlorination and sometimes mild acid hydrolysis appeared to reduce the digestibility of the cellulose organic matter.

Feeding experiments with young pigs, in which cellulose replaced a portion of the oatmeal in the rations, showed that the use of cellulose, the organic matter of which was digestible to the extent of 85 per cent. by adult pigs, was not profitable in feeding growing pigs. The cellulose could be used as part of the ration for sows non-pregnant or in the early weeks of pregnancy.—W. Godden.

1324

AGRICULTURAL RESEARCH COUNCIL. **Antibiotics in pig food.** *Agric. Res. Council. Rep. Ser. No.* 13, 1953, pp. 20, H.M.S.O., London. Price 1s. 6d. net.

This bulletin reports the results from 19 experiments on the value of aureomycin and procaine penicillin in rations for pigs. The experiments were made at 7 centres and on a number of farms in England and Wales and were co-ordinated by the Agricultural Research Council.

The experiment on creep feeds for suckling pigs covered 208 litters on 13 farms. Aureomycin was included at rates of 28.8 and 43.2 g. per ton of meal and procaine penicillin at 7.5 and 15.0 g. per ton. The differences between weaning weights at 9 weeks were not statistically significant but the results favoured antibiotic supplementation.

In the experiments on pigs from weaning to

bacon weight some rations contained vegetable protein only and others contained both vegetable and animal protein. Supplements of aureomycin (in Aurofac 2A) or procaine penicillin were added. Both the compositions of the rations and the rates of inclusion of antibiotics varied between different experiments. At one centre the pigs were fed to appetite but in all other experiments a feeding scale based on liveweight was used.

Pigs on rations containing animal protein grew 10.3 per cent. faster than the controls if procaine penicillin was included, and 9.4 per cent. faster with aureomycin. Pigs on rations containing vegetable protein only grew 12.4 per cent. faster than the controls if procaine penicillin was included and 16.2 per cent. faster with aureomycin.

The efficiency of feed utilisation was improved by both antibiotics. For vegetable protein rations it increased by 8.2 per cent. with aureomycin and 4.9 per cent. with procaine penicillin; for animal protein rations the respective increases were 6.2 and 7.3 per cent.—I. Lucas.

1325

FERRARI, E. Il rendimento dei suini nella trasformazione degli alimenti in carne e grasso. [Efficiency of pigs in the conversion of feeds to flesh and fat.] *Riv. Zootec.*, 1953, **26**, 224.

In an experiment with 4 groups of about 20 pigs each, starting at 53, 68, 83 and 104 kg. liveweight and fattened in 84 days to 97, 116, 139 and 155 kg., respectively, the feed requirements were 4.76, 4.90, 5.37 and 5.88 feed units per kg. increase. The increase in the heavier pigs was chiefly fat, and the energy value of 1 kg. liveweight increase was 4700 Cal. in the heaviest group, and 4200, 3600 and 3100 Cal. in the other groups, in descending order of liveweight; thus the "physiological return" of the heavier pigs was better. Since the price per kg. of lean and fat pigs is the same, the "economic return" is a different matter, and it is suggested that some adjustment should be made in the marketing system.—T. D. Bell.

1326

HUTCHINSON, K. J. **The influence of feeding practice on baconer carcass quality.** *Queensland Agric. J.*, 1953, **77**, 37-43.

Overfat bacon carcasses, often encountered in the market, should be eliminated by a long-term policy of selective breeding for later maturity. Meanwhile they can be avoided by restricting feeding and consequently rate of growth, in the later stages (100 to 200 lb.) of fattening. This can be done by individual feeding and careful control of the amount of meal given, but a more practical method is to replace some of the grain by a relatively indigestible constituent such as alfalfa chaff or chaffed peanut hay, which can be supplied to

appetite. Two trials were made to demonstrate this. In the first, under controlled experimental conditions, 5, 10 and 15 per cent. of the ration of meatmeal and grain was progressively replaced by alfalfa chaff from 100 to 200 lb. liveweight. The replacement reduced the rate of growth by 12 per cent. and thickness of back fat was less. In the second trial, under field conditions, the same replacement reduced rate of growth by 10 per cent. and thickness of back fat by 15 per cent. The economics of this procedure are discussed. Even in areas where carcass grade is not of first importance the use of cheap roughage may be financially advantageous.—T. D. Bell.

1327

WENIGER, J. and FUNK, K. Ausschlachtungsversuche und Schlachtmethode an Schweinen unter Berücksichtigung ihrer Futterverwertung [Slaughter experiments and slaughter methods with pigs, with reference to feed utilisation.] *Arch. Tierernährung*, 1952, **3**, 145-159. [Inst. Tierzucht, Martin Luther Univ., Halle, Wittenberg.]

For the most part this is a critical examination of the literature dealing with slaughter experiments as a means of assessing feed utilisation and the effects of breed and type of pigs on the results. From a study of the results of analyses of 685 samples of pork it is shown that there is a close correlation, $r = +0.995$, between dry matter and fat percentages:

$$\text{Fat per cent.} = \frac{\text{Dry matter per cent.} - 22.5}{0.76} \pm 1.5,$$

and from 142 analyses of carcasses, excluding stomach, intestinal, gall bladder and bladder contents, that there is a close correlation,

$$r = +0.85 \pm 0.073,$$

between percentage total fat content and the percentage fat in the ham:

$$\text{Total fat \%} = \frac{\text{Percentage fat in ham} + 5.88}{1.14} \pm 5.2.$$

Figures are given for the amounts of dry matter, protein, fat and ash expressed in g. in 9 pigs of 3 breeds of approximate liveweight 30 kg. and in 11 pigs of 4 breeds, approximate liveweight 40 kg. These figures are considered necessary as reference data for pig fattening trials, since such trials usually start with pigs of liveweight 30 to 40 kg.

W. Godden.

1328

STRUCK, M. Fütterungsfehler (Eiweissmangel) führt zur Braunfärbung des Fettes und Auftreten des Fäkalgeruches bei Schlachtschweinen. [An error in feeding (protein deficiency) causes brown pigmentation of fat and the appearance of faecal smell in pork car-

cases.] *Berl. Münch. tierärztl. Wochenschr.*, 1953, **66**, 277-278. [Zentralschlachthof, Hamburg.] English summary.

In a single year 48 pork carcasses, weighing nearly 7 metric tons, were condemned at the Hamburg slaughterhouse alone on account of discoloured fat and faecal odour of the flesh when cooking tests were made. Eight pigs from one herd had been fed on milo grain only, 11 from another on swill and fishmeal. It is suggested that such rations supply incomplete or poorly absorbed proteins and that liver damage insufficient to cause jaundice or visible cirrhosis is to blame for the defects of colour and odour. Heavy loss to the farmer can be avoided by better feeding.—W. M. Deans.

1329

BETTS, A. O. and BEVERIDGE, W. I. B. Virus pneumonia of pigs. The effect of the disease upon growth and efficiency of food utilisation. *Vet. Rec.*, 1953, **65**, 515-521. [Dept. Animal Pathol., Cambridge.]

The weight gains and feed conversion ratios to bacon weight were recorded in comparable groups, control and infected with virus pneumonia, of Essex and Essex \times Large White pigs in 2 experiments, one in summer and the other in winter. Infection was established by the intratracheal injection of a standard amount of a suspension of pneumonic lung. The ration consisted of barley-meal 40, miller's offals 30, maize-meal 20 and fish-meal 10.

In the summer experiment the mean daily weight increment to 200 lb. liveweight was 1.29 lb. for the control and 1.11 lb. for the infected pigs, the corresponding feed conversion ratios being 3.39 and 4.25:1. In the winter experiments, in which the housing conditions were unsatisfactory, the corresponding daily weight increments were 1.19 (control) and 0.92 lb. (infected) with conversion ratios of 3.85 and 4.90:1, respectively. These differences were in the main due to the uneven performances of the infected pigs, and in the summer experiment particularly, culling would have left animals with satisfactory performances.

During the experiments there was little or no evidence of illness, and the only signs other than sub-optimum growth were coughing and periods of inappetence, with accompanying rectal temperatures usually exceeding 104.5° F. The adverse effects were most noticeable between 19 and 24 weeks of age.

On the basis that at least 50 per cent. of the pigs in Great Britain have lesions of virus pneumonia at slaughter, the overall economic loss from the disease is computed to be 12.5 per cent. of the annual pig production of over £15 million.

A. N. Worden.

1330

BRADFORD, G. E., CHAPMAN, A. B. and GRUMMER, R. H. **Performance of hogs of different breeds and from straightbred and crossbred dams on Wisconsin farms.** *J. Animal Sci.*, 1953, **12**, 582-590. [Dept. Genetics, Wisconsin Agric. Exp. Stat., Madison.]

The data on 2827 litters of pigs farrowed and reared by gilts between 1947 and 1952 were studied. The breeds were Spotted Poland China, Duroc, Chester White and Poland China and crosses between these.

Between breeds the only significant differences were in the Poland China, which produced smaller litters, and the Spotted Poland China, which had a lower mortality rate. Crossbred gilts had litters with lower mortality than purebred, and hence a greater litter weight at 5 months, but there was no difference in individual weights. This was the only advantage shown by crossbred gilts.

T. D. Bell.

1331

BERGE, S., GJELSTAD, B. and SYRSTAD, O. Avkastningskontrollen med svin 5. november 1951-30 juni 1952. [Litter testing with pigs, 5 November 1951 to 30 June 1952.] *Meld. Norges Landbrukshøgsk.*, 1953, **33**, 145-161. English summary.

Composition of the meal mixture and the feed allowances, meal, milk, water and herring meal to 48 kg. liveweight, as used since litter testing has been revived in Norway, are given. Mode of feeding and feed consumption are described and the year's results are summarised.—I. Leitch.

1332

CLAUSEN, H. and THOMSEN, R. N. 40. og 41. beretning om sammenlignende forsøg med svin fra statsanerkendte avlscentre. 1950-51 og 1951-52. [40 and 41 Reports on comparative experiments with pigs at state-recognised breeding centres. 1950-51 and 1951-52.] *Forsøgslab. København Beretn.*, 1953, No. 267, 5-223.

1333

PARTANEN, J. Sikakantoja vertailevien kokeiden tulokset V: lta 1950. [Results of pig recording in Finland in 1950.] *Valtion Maatalouskoe-toiminnan Tiedonantoja* No. 233, 1953, pp. 20. [Sikatalouskoeasema, Tikkurila, Finland.] German summary.

The feeding system has a relatively simple meal mixture of maize and barley only, and potato silage is used. The usual details of feed consumption and carcass measurements are given.—I. Leitch.

See also Absts. 165, 450, 501, 502, 706, 707, 1353.

GOATS, RABBITS AND OTHER MAMMALS

1334

CONGIU, S. Indagini sulla resa al macello, sulla distribuzione ponderale e sulle correlazioni fra le diverse parti del corpo del dromedario somalo. [Particulars on the dressed carcass, fat distribution and correlations between the weights of the different organs of the Somali dromedary.] *Zootec. Vet.*, 1953, **8**, 188-191. [Ist. Sierovaccinogena, Merca.]

The camel is still of great economic importance as a beast of burden and as the main source of meat supply in the northern arid regions of Somalia. Only mature animals are slaughtered, usually about 10 to 12 years old. Poorly nourished animals are refused. The fat, particularly of the hump, is greatly prized. Data were obtained from the slaughter of 50 males and 100 females at the Merca abattoir. Average liveweight was 554 kg. for males and 574 kg. for females, with dressing percentages of 56.7 and 54.14, respectively. There was great variation in the weight of the humps, from 3.5 to 93 kg., average 20.2 kg. in females and from 3.0 to 45 kg., average 15.25 kg., in males. The liver, 12 kg., weighed more than the other organs combined. It is suggested that slaughter at 4 to 5 years of age would yield

meat of better quality, more suited to European taste. [Tables of results and of the correlations between liveweight and weights of different organs are referred to, but not presented. They are obtainable from the author.]—T. D. Bell.

1335

LYFTINGSMO, E. Reindrift. [Reindeer.] *Tidsskr. norske Landbruk*, 1953, **60**, 20-24.

A sketch of the difficulties of combining reindeer and sheep production on pasture to which the northern nomads have ancient legal rights.

1336

SKÅRMAN, S. Studies on the development of the fur in young of the mink, blue fox and silver fox. *Acta Agric. scand.*, 1953, **3**, 307-327. [Animal Breeding Inst., Wiad, Eldtomta, Sweden.]

1337

SHILOV, I. A. K voprosy o pitanii rechnogo bobra (Castor Fiber L.) [The problem of the nutrition of the river beaver (*Castor fiber*, L.).] *Zool. Zh.*, 1952, **31**, 924-931. [Kaf. Zool. Pozvon., Mosk. Gosud. Univ.]

The basic food of the river beaver depends to a large extent on geography. The preferred foods in the regions studied are willow and poplar; the preference is determined by their high dietary value. The fact that the beavers in the northern territories feed on birch and other substitute foods is due to absence of willow and poplar. The change-over to feeding on grass plants is from 2 to 3 months later in the north than in the south; the reverse change back to a diet of bark is from 1 to 2 months earlier in the north than in the south. Thus the beavers in the north are compelled to subsist on plants of low food value during the greater part of the year. (From Author's summary.)—W. Hughes.

1338

SHILOVA-KRASOVA, S. A. O pitanii ezhei (*Erinaceus Europaeus* L.) v yuzhnykh leasakh. [The nutrition of the hedgehog (*Erinaceus europaeus*, L.) in the southern forests.] *Zool.*

Zh., 1952, **31**, 944-947. [Kaf. Zool. Pozvon., Mosk. Gosud. Univ.]

Experiments on 2 groups of hedgehogs found in 2 different localities, 222 in one and 40 in the other, showed that the basic food of hedgehogs during the summer and autumn months was insects. Mice and lizards formed a very small percentage of the total food. The most popular insect was the May beetle (*Melolontha hippocastani*), which formed 76 per cent. of the insects eaten. During May the hedgehog lives practically exclusively on this beetle, and can eat up to 100 of them in 24 hr. Hedgehogs will also eat the beetle larvae, digging them up in order to do so. A list is given of all the insects in the diet and the proportions in which they occur.—W. Hughes.

1339

SAUNDERS, J. A. Kittens reared on an 'artificial' diet in the laboratory. *J. Physiol.*, 1953, **121**, 12P-13P. [Dept. Physiol., Med. Sch., King's Coll., Newcastle upon Tyne.]

POULTRY

GROWTH AND FATTENING

1340

FELTWELL, R. Intensive methods of poultry management. *Minist. Agric. Fish. Bull.* No. 152, July 1952, pp. iv + 62. H.M.S.O. London. Price 3s. net.

The deep litter, poultry yard and battery systems are described in detail, and housing, management, feeding and egg production under each system are discussed. The introductory part contains advice and recommendations on the system to adopt, choice of breed, choice of site, and culling and replacements.—T. D. Bell.

1341

HENDERSON, E. W. Growth of twelve-week old chickens not affected by size of eggs. *Quart. Bull. Michigan Agric. Exp. Stat.*, 1953, **35**, 436-439. [Dept. Poultry Husb., East Lansing.]

1342

MCDONALD, M. W. and McClymont, G. L. Condensed whale solubles. An efficient replacement for meatmeal in chicken rations. *Agric. Gaz. N.S.W.*, 1953, **64**, 303-304; 324-325. [Poultry Exp. Stat., Seven Hills.]

Whale solubles were tested as a substitute for meatmeal in chick rations with high or low contents of the vitamin B complex.

Rations low in B vitamins gave very poor growth, especially if all the meatmeal was replaced by whale solubles, but if the supply of B vitamins

was adequate whale solubles could replace some or all of the meatmeal without affecting growth adversely. If the meatmeal content was below 10 per cent., additional Ca was required, and if it was below 6 per cent. P was required also.

P. C. Jowsey.

1343

PATRICK, H. Supplements for a "meat-scrap" type chick ration. *Poultry Sci.*, 1953, **32**, 570-572. [Poultry Dept., Univ. Tennessee, Knoxville.]

Groups of 10 day-old New Hampshire chicks from hens given a meat scraps ration were themselves given a basal ration containing 18 per cent. meat scraps. In experiment 1, the following supplements were given, replacing an equal weight of maize: 10 per cent. soya bean oilmeal, 20 p.p.m. nicotinic acid, 0.2 per cent. choline, 5 per cent. brewer's yeast, 3 p.p.m. folic acid, 1 mg. vitamin B₁₂ per 100 lb. feed.

Average liveweights of the chicks at 5 weeks of age were 178 (control), 279, 201, 180, 223, 186 and 193 g., respectively. In experiment 2, the groups were: control, 10 per cent. soya bean oilmeal, 0.3 per cent. methionine, 0.3 per cent. lysine, 5 per cent. casein, 20 p.p.m. nicotinic acid plus 3 p.p.m. folic acid, 0.3 per cent. methionine plus 0.2 per cent. choline. Average liveweights at 5 weeks were 283, 473, 300, 398, 460, 315 and 320 g., respectively. In experiment 3, the groups were: control, 0.3 per cent. lysine, 10 p.p.m. bacitracin, 10 p.p.m. bacitracin plus 0.3 per cent. lysine, 2 p.p.m. procaine penicillin, 2 p.p.m. procaine

penicillin plus 0.3 per cent. lysine, 10 p.p.m. terramycin, 10 p.p.m. terramycin plus 0.3 per cent. lysine, 20 p.p.m. aureomycin, 20 p.p.m. aureomycin plus 0.3 per cent. lysine, 10 per cent. soya bean oilmeal, 5 per cent. casein. Average liveweights at 5 weeks were 198, 302, 266, 326, 268, 332, 312, 340, 264, 328, 328 and 318 g., respectively. This experiment was repeated in duplicate, but omitting the last 2 groups; corresponding average liveweights at 5 weeks were 196 and 309, 267 and 358, 268 and 304, 273 and 386, 286 and 362, 293 and 386, 293 and 308, 324 and 392, 299 and 334, 324 and 372 g.—M. J. Head.

1344

RENNER, R., CLANDININ, D. R. and ROBBLEE, A. R. **Action of moisture on damage done during over-heating of soybean oil meal.** *Poultry Sci.*, 1953, **32**, 582-585. [Poultry Div., Univ. Alberta, Edmonton.]

The soya bean oilmeals used in this trial were produced experimentally by autoclaving for 4 min. at 15 lb. pressure; for 30 min. at 15 lb.; or for 4 hr. at 15 lb. with 0, 25, 50 or 100 per cent. of water added. Practical starter rations containing the meals were given to groups of day-old Single Comb Leghorn chicks for 3 weeks and the group average liveweights were 204, 209, 135, 166, 161 and 163 g., respectively. When the meals were given with a semi-synthetic ration, the group average liveweights were 178, 175, 72, 102, 126 and 139 g., respectively.—M. J. Head.

1345

BOSE, S., THAKRAL, B. M. and NARAYANAN, S. **The utilisation of mango-seed kernel and Jaman seed meal in a simplified poultry ration for growing chicken.** *Indian J. Vet. Sci.*, 1952, **22**, 247-250. [Poultry Res. Sect., Indian Vet. Res. Inst., Izatnagar, Uttar Pradesh.]

It was shown that mango seed kernel and Jaman seed meal, both waste products, could replace 20 per cent. of maize in a growing ration for chickens.

J. S. Thomson.

1346

PATRICK, H. **Deficiencies in a sesame meal type ration for chicks.** *Poultry Sci.*, 1953, **32**, 744-745. [Poultry Dept., Univ. Tennessee, Knoxville.]

In experiments with New Hampshire chicks a ration with 30 per cent. sesame meal was slightly improved by addition of lysine, an antibiotic or vitamin B₁₂ but not nearly to the value of a ration with milk albumin or soya bean meal. Feather pigmentation was improved, but not normal, with lysine supplementation but not with antibiotic feeding. Supplementation with milk albumin or soya bean made feather pigmentation normal.

M. J. Head.

1347

SCHOLTYSEK, S. **Die Rolle des Methionin in der Geflügelfütterung. [Role of methionine in poultry feeding.]** *Arch. Geflügelk.*, 1953, **17**, 155-163. English summary.

A brief review.

1348

SLINGER, S. J., PEPPER, W. F. and HILL, D. C. **Value of methionine supplementation of chick and poult diet containing a high percentage of wheat.** *Poultry Sci.*, 1953, **32**, 573-575. [Dept. Poultry Husb., Ontario Agric. Coll., Guelph.]

The birds were grouped by weight. In the first experiment 20 day-old Columbia Red chicks were housed in battery brooders and given a ration containing about 61 per cent. ground wheat to 52 days of age, then 54 per cent. wheat to 70 days, the methionine contents being 0.34 and 0.29 per cent., respectively. Supplements of 0.5, 0.75 and 1.0 lb. DL-methionine per ton of feed were given, but no improvement in chick weight was observed. The experiment was repeated with a ration containing 53 per cent. ground wheat for 100 day-old Columbia Red chicks housed on an open floor with wood shavings as litter, and with a ration containing 21 per cent. ground wheat for 33 male and 37 female day-old Broad Breasted Bronze turkey poults housed on an open floor, but there was no improvement in liveweight increase.

M. J. Head.

1349

EBBELL, H. **Der Einfluss einer Beigabe von Methionin und eines Terramycin-Produktes auf das Kükenwachstum. [Effect of supplements of methionine and a terramycin product on the growth of chicks.]** *Arch. Geflügelk.*, 1953, **17**, 145-154. [Ovomaltine Farm, Oberwangen, Berne.] English summary.

Four groups of day-old chicks, 287 in all, were given an approved all-mash ration; one group acted as a control and the others had the ration supplemented with 0.15 per cent. DL-methionine or with 0.1 per cent. of a vitamin B₁₂-terramycin concentrate given for 6 weeks to one group and 8 weeks to another. The birds were separated by sex after 6 weeks and the experiment terminated after 10 weeks.

The addition of methionine gave a growth response, as compared with the controls, of 2 per cent. with the cockerels and 6.5 per cent. with the pullets. The terramycin supplement for 6 weeks gave responses of 5 and 12 per cent., respectively, and no further benefit resulted from continuing the supplement for 8 weeks. In general the terramycin supplement gave more uniform birds, a better quality in the finished broiler and fewer rejects at 6 weeks.—W. Godden.

N.A. and R., January 1954

1350

ANDERSON, G. W., SLINGER, S. J. and PEPPER, W. F. **Bacterial cultures in the nutrition of poultry. 1. Effect of dietary bacterial cultures on the growth and cecal flora of chicks.**

ANDERSON, G. W., SLINGER, S. J., PEPPER, W. F. and HAUSER, M. M. **2. Effect of dietary coliform cultures on the growth and cecal flora of poults.** *J. Nutrition*, 1953, **50**, 35-46; 47-57. [Dept. Bacteriol., Ontario Agric. Coll., Guelph.]

1. Sixteen groups of 20 male chicks were given a basal diet supplemented with one of 5 bacterial cultures isolated from the caeca of chicks, with or without 10 p.p.m. procaine penicillin. Pooled caecal contents from 5 birds were well mixed and 1 g. was used for plating; pH estimations were made on the remainder of the sample. The cultures used were of typical *Bacterium coli*, 2 strains of atypical *Bact. coli*, micrococci and anaerobes. The basal diet supplemented with penicillin alone caused increases in weight which were not significant. One of the atypical *Bact. coli* cultures caused a significant weight increase without penicillin, and all 3 coliform cultures with penicillin gave greater weights than without, or than penicillin alone. Two of these increases were significant and indicated a synergistic reaction between the corresponding culture and the antibiotic. The micrococci without penicillin depressed the weight of the chicks, but this inhibitory effect was completely removed by administration of penicillin with the culture. No weight increase was observed with or without penicillin when the anaerobes were given, but feed efficiency was greater.

In a second experiment 10 groups of 20 chicks of both sexes were given the basal diet as in experiment 1 either alone or supplemented with a mixed culture of the coliform bacteria used separately in experiment 1, or the filtrate or the washed cells from the centrifuged mixed culture. Part of each group received penicillin as well. A significant increase in weight was recorded only in the group receiving filtrate plus penicillin. In both experiments penicillin tended to reduce the pH and the numbers of bacteria which could be isolated from the caeca of the chicks. When, however, the antibiotic was given with the cultures, the pH reduction was not so marked. Changes in the numbers of aerobes, anaerobes, coliform bacteria, lactobacilli and enterococci resulted from giving the cultures with or without penicillin. In a few cases the changes were significant but in no case was there a clear shift to the type of culture used. It is suggested that the association of greatest weights and feed:gain ratios with the lowest enterococci counts may be of importance.

2. A mixed culture of coliform bacteria isolated

from the caeca of chicks receiving penicillin caused a non-significant increase in weight of poults when given in conjunction with a practical ration and penicillin. Washed viable cells from this culture gave similar results. Neither the filtrate nor the killed cells from this culture caused any change in weight. A typical *Bact. coli* culture produced a significant increase in weight. When given along with penicillin this culture slightly enhanced the activity of the penicillin. An atypical *Bact. coli* culture increased the weight of female poults, but this increase approached significance only at the 5 per cent. level. No change was found when this culture was given with penicillin. As before, the pH of caecal contents was reduced by penicillin. The weight increases caused by the addition of penicillin and coliform cultures to the diet could not be related to the changes in numbers of the types of bacteria isolated from the caeca of the poults.—M. J. Masson.

1351

ROMOSER, G. L., SHORB, M. S. and COMBS, G. F. **Effect of orally administered penicillin-resistant microorganisms on growth of chicks.** *Proc. Soc. Exp. Biol. Med.*, 1953, **83**, 17-21. [Dept. Poultry Husb., Univ. Maryland, College Park.]

Groups of fifteen 20-day-old chicks of both sexes were used to compare the growth effects of a practical ration with supplements as follows: a mash fermented with *Aerobacter aerogenes*, isolated from the caeca of chicks, at levels of 0.4 and 2.0 per cent. of the practical ration; 10 p.p.m. penicillin; or dried *A. aerogenes* or both. Increased weight gains resulted from addition of the mash to the basal diet at both levels; with 2.0 per cent. increases were comparable with those on the diet with penicillin alone. Dried *A. aerogenes* added to the diet gave weights greater than those obtained from the diet and penicillin alone and the biggest weight increases of all were reported for the group receiving both dried *A. aerogenes* and penicillin. The experiment lasted 4 weeks.

A second experiment showed that when dried cultures of *Bacterium coli* or *A. aerogenes* were added to the basal diet without lactose or penicillin, growth was slightly improved. The addition to the diet of 3 per cent. lactose and 10 p.p.m. penicillin alone caused a marked increase in growth, and the addition of either *Bact. coli* or *A. aerogenes* as well caused an even greater increase. When both cultures were given with lactose and penicillin the greatest increase of all was found.

M. J. Masson.

1352

BLETNER, J. K., CLARK, T. B., WEAKLEY, C. E. (Jr.) and VANLANDINGHAM, A. H. **The effect of sulfaquinoxaline in different ration formulations on growth and feed efficiency of**

coccidia-free chicks. *Poultry Sci.*, 1953, **32**, 733-739. [W. Virginia Agric. Exp. Stat., Morgantown.]

After 3 weeks on starter mash, 16 groups of 10 coccidia-free chicks were given experimental rations for 28 days. Four rations were used in a 4 × 4 Latin square layout: rations 1 and 4 were similar to commercial broiler rations in use before the introduction of high energy rations, ration 2 contained more crude protein and less fibre and ration 3 was a typical early high-energy ration. Sulphaquinoxaline was given at the rate of 0.00625 and 0.0125 per cent. with each ration, but was found to have no effect on growth. At the therapeutic level of 0.05 per cent., signs of toxicity were observed.

Some unexplained differences in growth occurred in birds in different parts of the battery, and emphasis is laid on the importance of sufficient replication. Fasting the chicks for 12 hr. before weighing had no effect on this variability.

M. J. Head.

1353

GERARD, W. E., READ, D. C. and PENSACK, J. M. **A comparative evaluation of several antibiotics on chick and swine growth.** *J. Agric. Food Chem.*, 1953, **1**, 784-788. [Res. and Development Dept., Commercial Solvents Corp., Terre Haute, Ind.]

In a series of 7 trials chicks housed on wire screen floors were fed from day-old to 4 weeks of age on a ration of soya bean meal 24, oats 10, wheat middlings 5, fishmeal 3, alfalfa meal 2.5, minerals 4, *DL*-methionine 0.05, choline chloride 0.02, riboflavin supplement, vitamin B₁₂ supplement, vitamin A and D supplement, nicotinic acid, Ca pantothenate and yellow maize meal to 100. Other chicks received the same ration supplemented with 2 g. per ton of the 1-N-methyl-1:2-diphenyl-2-dihydroxyethylamine salt of penicillin G (I), each treatment being given to duplicate lots each of 20 chicks. The mean increase in weight with (I) in each trial ranged from 23 g. to 65 g. In each trial one other antibiotic was tested at a series of levels from 1 to 50 g. per ton of ration. Growth stimulation was obtained with bacitracin, aureomycin, terramycin, erythromycin and "antibiotic B" [no detail given], though the stimulation was less, or only obtained at higher levels, than with (I). No growth stimulation was obtained with 1-4-thiazolidone-2-caproic acid (Antibiotic A).

In a bacon pig feeding trial a group of 13 weanling pigs of average weight 45 lb. were housed with access to a half-acre plot of clover pasture, with shelled maize always available, and also a pelleted supplement of soya bean meal 80, minerals 14, fishmeal 3, condensed fish solubles 1, choline chloride 0.2, riboflavin, B₁₂ and vitamin A and D

supplements, nicotinic acid and Ca pantothenate. This group took 113 days to reach a mean bodyweight of 200 lb. and used 3.33 lb. feed per lb. liveweight gain. A parallel group having the pellets supplemented with 5 g. (I) and 25 g. bacitracin per ton reached 200 lb. bodyweight in 104 days, using 3.15 lb. feed per lb. liveweight gain. Other groups receiving aureomycin or erythromycin also showed faster growth than the control group, but with smaller gains in feed conversion efficiency than the group supplemented with "penicillin-bacitracin". The maize and the supplement were eaten in the proportion of about 7 to 1.—K. J. Carpenter.

1354

FRÖLICH, A. **Försök med antibiotika till kycklingar.** [I. Som fodertillskott till allsidiga foderstater. **[Experiments with antibiotics for chicks. 1. As supplements to complete rations.]** *Kgl. Lantbruksakad. Tidskr.*, 1953, **92**, 151-163. [Stat. Hushjursförsök, Uppsala.] English summary.

The literature and theories on the mode of action of antibiotics are briefly reviewed and the results of all experiments at the State Experiment Station at Uppsala are summarised and discussed.

By-products of stated residual antibiotic value were more effective as growth stimulants than were "pure APF" products. In the experiments medicinal standard procaine penicillin and aureomycin were used, but the bacitracin and terramycin were relatively impure concentrates guaranteed to have 11 g. antibiotic per kg. For each of these antibiotics the percentage increase in weight gain to 4 weeks of age and the percentage of saving of feed per unit weight gain are shown for different amounts of antibiotic per ton of feed. These ranged from zero to about 25 per cent.; there was no evidence of injury. On the average of different concentrations, the effect of penicillin was greatest during the first week and decreased with age. It differed from one experimental room to another, and over 9 months showed a remarkable rise in the amount required to give a response.

I. Leitch.

1355

MORIMOTO, H., ARIYOSHI, S. and HOSHII, H. **[Studies on the effect of antibiotic substance on the growth of chicks. 1. On the mechanism of the growth-promoting activity of antibiotic substances.]** *Bull. Nat. Inst. Agric. Sci., Chiba [G]*, 1953, No. 6, 139-145. In Japanese: English summary.

Chickens on a ration containing fishmeal with a supplement of terramycin or a ration without fishmeal with an animal-protein factor supplement showed higher levels of vitamin B₁₂ in the liver

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than animals on the unsupplemented rations. The reverse was true for riboflavin. Chickens on the supplemented rations showed higher N retentions. Counts of lactobacilli and of yeast imperfecti in the intestine were lower in the terramycin group than in controls.—J. S. Thomson.

1356

MÜLLER, W. Zulage von Antibiotica-Präparaten zu einer handelsüblichen Mastmischung für Hähnchen. Bericht über einen auf Veranlassung der Vereinigung Schweiz. Futtermittelfabrikanten (VSF) im Parc avicole Coppet (Besitzer: H. Séguin) durchgeführten Versuch. [Addition of antibiotic preparations to a commercial fattening meal for cockerels. Report on an experiment made in the Parc avicole Coppet (proprietor H. Séguin) at the request of the Swiss Feedingstuffs Manufacturers Association (VSF).] *Arch. Geflügelk.*, 1953, 17, 201-208. English summary.

The antibiotics used were terramycin, penicillin, aureomycin, terramycin plus penicillin and aureomycin plus penicillin. Four groups of 20 cockerels, 7 weeks old, were used for each supplement to a standard ration and 4 groups served as a control. The feeding lasted for 26 days. All the antibiotics improved growth rate and feed efficiency; terramycin gave the best results. When mixtures of antibiotics were used there was no evidence of any additional effect. Allowing for the cost of the antibiotics the improved efficiency reduced the feed costs per kg. gain by 6 to 15 per cent. compared with that of the control groups.—W. Godden.

1357

SAXENA, H. C., STARR, M. E., BLAYLOCK, L. G., CARVER, J. S. and MCGINNIS, J. Effect of dietary penicillin on the efficiency of protein utilization by chicks. *Arch. Biochem. Biophys.*, 1953, 44, 346-350. [Dept. Poultry Sci., State Coll. Washington, Pullman.]

Eighteen groups of 10 day-old New Hampshire × White Olympian chicks, obtained from a flock receiving fishmeal in the ration, were given feeds containing 15, 18 and 21 per cent. protein with or without 3 p.p.m. diamine penicillin, 1100 units per mg. All feeds were adequate in all known vitamins. The N retention of each group of chicks was studied for two 7-day periods, beginning on the 14th day of experiment.

At 4 weeks of age, the groups given penicillin were significantly heavier than their controls on each protein level. All groups on the lowest protein level were lighter than the others, but the increase due to penicillin feeding was similar at all protein levels. Feed efficiency was better at the 18 and 21 per cent. protein levels regardless of

supplementation, but penicillin improved efficiency at all protein levels. Small but not statistically significant increases in N retention were found in the birds receiving the penicillin supplement at the lowest protein level.—M. J. Head.

1358

SAXENA, H. C., BLAYLOCK, L. G., STADELMAN, W. J., CARVER, J. S. and MCGINNIS, J. Effect of penicillin on growth, feed efficiency and fattening of turkeys. *Poultry Sci.*, 1953, 32, 721-726. [Dept. Poultry Sci., State Coll. Washington, Pullman.]

Sixteen groups of 30 day-old Broad Breasted Bronze turkeys, both sexes, were given a maize, soya bean and herring meal starter ration to 8 weeks of age, 8 groups receiving 3 p.p.m. diamine penicillin in addition. At 8 weeks of age, 25 birds from each group were transferred to houses on range and given a mixed developer meal; half of those birds which had received antibiotic to 8 weeks of age continued to receive it while the remainder did not, and half of the birds which had not received the diamine penicillin began to get it.

The effect of the antibiotic supplement was greatest when it was given for the entire experimental period of 24 weeks, by which time the males had gained 809 g. and the females 488 g. more than the control birds. To 8 weeks of age antibiotic supplementation increased the growth of both sexes by 178 g. over the controls. Supplementation from 8 to 24 weeks of age also gave an increase in growth over the controls. Feed efficiency was considerably improved by the antibiotic, and carcass quality, judged by subcutaneous fat deposition, was improved. An analysis of the economics of giving the supplement showed that it could profitably be given throughout the life of a fattening turkey.—M. J. Head.

1359

SWICKARD, M. T., HARKIN, A. M. and MARSDEN, S. J. Palatability of turkeys fed experimental diets containing aureomycin and fish products. *Poultry Sci.*, 1953, 32, 726-729. [Bur. Human Nutrit., U.S. Dept. Agric., Washington 25, D.C.]

Turkeys reared on a commercial mash, which included 5 per cent. of menhaden fishmeal, were killed at 14, 16 and 26 weeks of age, and after storage at 0° F. they were roasted and the meats were tasted by an expert panel. Parallel birds that had received 10 mg. aureomycin hydrochloride per kg. mash were tasted at the same time.

Some off-flavour was noticed in most of the younger birds, but in only a few of those killed at 26 weeks. Inclusion of the antibiotic in the ration did not affect eating quality at any age.

K. J. Carpenter.

1360

YOUNG, R. J., GILLIS, M. B. and NORRIS, L. C. **An unidentified factor in peanut meal required by the chick.** *J. Nutrition*, 1953, **50**, 291-297. [Agric. Exp. Stat., Cornell Univ., Ithaca, N.Y.]

Chicks were fed from day-old to 4 weeks of age on a ration of casein 25, hydrogenated vegetable fat 2.5, cellophane 3, minerals 4.2, choline 0.15, purified vitamins and maize starch to 100. Growth on this ration was poor, but was increased by the addition of arginine, the maximum effect being reached when the ration contained 1.7 per cent. arginine in all. Even at this level growth was subnormal, with a mean chick weight of 275 g. at 4 weeks of age. Performance was not improved by using less highly purified samples of casein.

Similar rations containing 15 per cent. groundnut meal, extracted for 48 hr. with ethanol and for 24 hr. further with methanol, which was added at the expense of casein and starch so as to keep the total protein constant, supported faster growth, with chicks reaching a mean weight of 325 g. In the presence of additional arginine the same performance was obtained with only 5 per cent. groundnut meal. Analysis suggested that no other amino-acid deficiency could be corrected by the addition of groundnut meal and it was concluded that this material supplied an unknown growth substance essential for the chick.—R. J. Carpenter.

1361

CARVER, D. S. and JOHNSON, E. L. **Unidentified growth factors for the chick in vegetable oils and fatty acid concentrates.** *Poultry Sci.*, 1953, **32**, 701-705. [Dept. Poultry Husb., Iowa State Coll., Ames.]

Groups of day-old chicks [number and breed not specified] were given adequate nutrients with a synthetic ration based either on casein and glucose, containing 0.05 per cent. fat, or on soya bean protein and glucose, containing 0.04 per cent. fat, and some groups were given 4 per cent. maize oil in addition. Liveweight at 4 weeks of age was increased and mortality was low in groups given the oil supplements. In a second experiment, supplements of 4 per cent. refined maize oil, 4 per cent. crude maize oil or 4 per cent. soya bean oil were added to the ration of soya bean protein and glucose; the average liveweights at 4 weeks of age were 136 g. for the basal ration and 205 g., 201 g. and 184 g., respectively, with the supplements, the respective feed efficiencies being in units of feed per unit gain 2.85, 2.23, 2.25 and 2.21. In a further series of experiments, supplements of crude maize oil, wheat germ oil, oleic acid and linoleic acid, either alone or combined, were added to the same basal ration and all increased growth rate to 4 weeks of age; supplements of stearic acid did not increase growth rate. These

unsaturated oils are thought to contain growth-promoting substances for the chick, oleic acid and wheat germ oil being especially potent.

M. J. Head.

1362

MILLER, O. N. **An unrecognized nutritional factor (cornstarch) required by the duck.** *J. Nutrition*, 1953, **50**, 13-22. [Dept. Biochem., Univ. Texas Med. Branch, Galveston.]

Thirty-one newly hatched ducklings were housed in cages with raised screen floors and fed on a ration of casein 18, gelatine 10, maize oil 10, cellulose 4, minerals 5, vitamins A, B₁, B₆, D, E, and K, biotin, Ca pantothenate, folic acid, nicotinic acid and riboflavin, and maize starch to 100. At 32 days of age the birds had a mean weight of 990 g., and were of good general appearance. Birds fed on the same ration with sucrose replacing maize starch weighed 780 g. and appeared less healthy.

Both groups were killed, and at post-mortem examination 21 per cent. of the maize starch group showed lesions of pancreatic fibrosis, and 87 per cent. of the sucrose group.

In further trials neither vitamin B₁₂ with inositol nor methionine was of value in preventing the onset of the condition in the birds receiving sucrose. The addition of 10 per cent. of maize starch was sufficient to prevent its appearance, and sugar refiner's "mud" was partly effective at low levels.

It is considered possible that the active material in commercial maize starch may be identical with Schwarz's "factor 3" (Abst. 1037, Vol. 22), which has been reported to be present in some strains of yeast and to prevent liver necrosis in young rats.

K. J. Carpenter.

1363

HANSEN, R. G., LARSON, B. L., KRICHEVSKY, P., SCOTT, H. M. and NELSON, T. S. **Growth stimulators and growth inhibitors in forage and forage juice concentrate.** *J. Dairy Sci.*, 1953, **36**, 581. *Proc.* [Univ. Illinois, Urbana.] Experiments with chickens.

1364

ANDREWS, F. N., MILES, S. R. and DAVIS, O. S. **Response of inbred lines of chickens to thiouracil.** *Endocrinology*, 1953, **52**, 712-718. [Purdue Univ., Lafayette, Ind.]

See also Absts. 382-84, 410, 430, 440, 469, 483, 507, 1368, 1370.

EGG PRODUCTION

1365

TITUS, H. W. **Variation of egg production and hatchability.** *Poultry Sci.*, 1953, **32**, 593-601. [Lime Crest Res. Lab., Limestone Products Corp. America, Newton, N.J.]

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The results of a uniformity trial on egg production and hatchability are presented. The birds were kept in 24 pens of 25 birds and the means for both variables are given, along with estimates of variability. [The individual bird is used as the unit of variability, although the birds were fed, housed, and mated in groups of 25]. From these results, estimates are made of the differences which would be detected at given significance levels, for differing average numbers of eggs and for differing average hatchability. Finally, it is shown how to estimate, if the variability is assumed to be known, how many birds would be required to detect a difference of a given size, and an example is given.—A. W. Boyne.

1366

ROSENBERG, M. M. **A study of B-grade and refinery B-molasses in layer rations.** *Poultry Sci.*, 1953, **32**, 605-612. [Dept. Poultry Husb., Univ. Hawaii, Honolulu.]

B-grade molasses is the portion of the massecuite forcibly removed from the centrifugal sugars during the second centrifuging; low-grade sugar and blackstrap molasses are obtained from it in the third strike. It is a viscous liquid and has an approximate composition of sucrose 48, water 20 and impurities 32 per cent., the latter consisting of about equal parts of reducing sugars, organic non-sugars and ash. One part of the molasses compounds was mixed with 5 parts of ground dried bagasse pith. Refinery B-molasses was also tested, since it is produced by sugar refiners in the temperate zones.

In trials with 7 groups of 10 New Hampshire pullets, rations were given containing 29.6, 38.8 and 47.9 per cent. B-grade molasses (groups 1 to 3) or refinery B-molasses (groups 4 to 6) over a 20-week period. The egg production of the groups was 65, 63, 64, 66, 59 and 43 per cent., compared with 71 per cent. for the controls. Groups 3 to 6 inclusive laid significantly smaller eggs than the controls; feed efficiency fell as the concentration of sugar by-product in the ration increased. The bodyweight of the experimental groups did not increase as much as that of the controls and the hatchability of the eggs was lower on rations containing sugar by-products.

In the second trial, 16 groups of 9 New Hampshire pullets were given rations without or with 29.6, 38.8 or 47.9 per cent. B-grade molasses along with 5.9, 7.7 or 9.6 per cent. bagasse pith for 16 weeks. Egg production on the 2 higher levels of sugar by-product feeding was lower than in controls but no statistically significant effect on egg size was observed. Liveweight gain and feed efficiency were significantly depressed as the proportion of sugar by-product in the ration was increased.—M. J. Head.

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1367

FLETCHER, J. L., BARRENTINE, B. F., DREESSEN, L. J., HILL, J. E. and SHAWVER, C. B. **The use of ferrous sulfate to inactivate gossypol in diets of laying hens.** *Poultry Sci.*, 1953, **32**, 740-742. [Dept. Animal Husb., Mississippi Agric. Exp. Stat., College Station.]

The 3 groups of 11 New Hampshire hens used in this trial received the following rations: normal control, control with 10 per cent. cottonseed meal replacing 10 per cent. protein concentrates, and the same plus 0.5 per cent. ferrous sulphate. The cottonseed meal consisted of equal parts of hydraulic- and solvent-extracted meal and contained 0.3 per cent. free gossypol. All the eggs from each group were stored for 60 or 150 days at 34° F.; 5 out of 90 eggs from the first group had slightly dark yolks, and 6 out of 117 from the third group.—M. J. Head.

1368

SIZEMORE, J. R., LILLIE, R. J., DENTON, C. A. and BIRD, H. R. **Influence of aureomycin in the chick diet upon subsequent reproductive performance of laying hens.** *Poultry Sci.*, 1953, **32**, 618-624. [Bur. Animal Indust., Agric. Res. Admin., Beltsville, Md.]

All the Rhode Island Red chicks used in this trial were given a similar mash and were kept on sawdust litter to 8 weeks of age. From this age to 22 weeks, groups 1 and 2 received the Connecticut broiler ration (CBR), groups 4 and 5 CBR plus antibiotic, groups 7 and 8 a mixed maize and soya bean ration (CS) and groups 10 and 11 CS plus antibiotic; all groups had mixed wheat and maize free choice in addition. The antibiotic was supplied as 0.5 per cent. of a supplement containing 1.8 mg. vitamin B₁₂ and 1.8 g. aureomycin hydrochloride per lb. At 22 weeks of age, representatives of each group were placed in each of 6 wire-floored houses and 8 sawdust litter houses, making groups of 40 and 36 for the respective types of house. The groups on sawdust litter were given a standard laying mash containing ample vitamin B₁₂ and the groups on wire floors a maize and soya bean ration deficient in vitamin B₁₂, with or without antibiotic.

For the rearing period on range up to 22 weeks of age, the birds given antibiotic grew faster than the controls, but the supplement had no effect on age at sexual maturity or on mortality. During the laying period, no effect of chick diet or laying diet was found on egg production, mortality, egg weight or shell thickness. The hatchability of fertile eggs was greater from hens which had received antibiotic in the rearing period, even when aureomycin was included in the laying ration; this effect was not observed when the laying ration contained adequate vitamin B₁₂.

The eggs from different groups showed only small differences in their vitamin B₁₂ content.

M. J. Head.

1369

SLINGER, S. J., MORPHET, A. M., HUNT, E. C. and PEPPER, W. F. **Effect of penicillin on the reproductive performance of turkeys.** *Poultry Sci.*, 1953, **32**, 660-669. [Dept. Poultry Husb., Ontario Agric. Coll., Guelph.]

One young tom was placed in each of 12 groups of 9 Broad Breasted Bronze turkeys in their first laying year and 2 groups of 10 in their second laying year. All birds were in the same house. They were given an all-mash ration, starting 8 weeks before eggs were saved for hatching, and their houses were artificially lit to give a 14-hr. day. Even-numbered groups received a supplement of 2 g. crude procaine penicillin G per ton feed from 28 January to 16 June. The supplements were then given to the odd-numbered groups until the end of the experiment on 3 August. Eggs were hatched at regular intervals during the feeding trials.

The results showed that the penicillin supplement reduced hatchability, owing, apparently, to high incidence of early dead germs. The average group hatchability up to 16 June was 65.3 per cent. without and 50.4 per cent. with penicillin. After the reversal of the rations, the hatchability of eggs from birds receiving penicillin fell from 69 per cent. on 16 June to 22.3 per cent. on 4 August and that of the eggs from birds now receiving no supplement rose from 37.4 to 45.2 per cent. on 7 July and fell again to 24.6 per cent. on 4 August. This effect on hatchability was significant only at the 10 per cent. level in paired pens of birds, owing mainly to the high variation in the effect of supplements. The penicillin groups produced 314 eggs fewer between 1 April and 16 June than the unsupplemented groups. After the reversal of rations, the groups receiving penicillin laid 167 eggs more from 16 June to 4 August than those with no supplement. Egg production in both groups was declining at the time of change in ration. During the first period, the eggs from the penicillin groups weighed 2.27 g. less than those

from the unsupplemented groups ($P > 0.08$). The feed consumption of the penicillin groups was 5.4 per cent. below that of the unsupplemented groups.

M. J. Head.

1370

ARSCOTT, G. H. and COMBS, G. F. **Further evidence for an unidentified hatchability factor in condensed fish solubles.** *Poultry Sci.*, 1953, **32**, 730-733. [Dept. Poultry Husb., Univ. Maryland, College Park.]

During a 13-week preliminary period, 200 New Hampshire pullets were given a maize-wheat-soya bean ration containing 0.5 g. iodinated casein per 100 lb. feed to deplete their reserves of vitamin B₁₂ rapidly. On the basis of the hatchability and fertility of eggs laid and the total egg production during the first 7 weeks of this period, the birds were equally divided into 5 groups. Groups 1 to 4 were housed on raised wire floors and group 5, the positive control, on litter. During the first 11 weeks of the 29-week experimental period groups 1 to 5 received, respectively, 0, 0.5, 0.75, 1.0 and 1.25 µg. vitamin B₁₂ per lb. feed and for the next 12 weeks 0, 0.4, 0.6, 0.8 and 1.0 µg.; for the remaining 6 weeks groups 2, 3 and 4 received 0.4, 0.6 and 2.0 µg. vitamin B₁₂ per lb. feed and groups 1 and 5 received 3 per cent. condensed fish solubles. At the end of period 2, i.e., after 23 weeks of experiment, the hatchability of eggs from groups 1 to 5 was 17, 33, 47, 44 and 70 per cent., respectively. At the end of period 3, the hatchability of eggs from groups 1 and 5 was 77 and 84 per cent., respectively, but that of the other 3 groups remained low.

A preliminary growth test on chicks hatched from eggs collected during period 3 indicated some degree of carry-over of the substance in the condensed fish solubles.—M. J. Head.

1371

LIBBY, D. A., GROSCHKE, A. C., EVANS, R. J. and BANDEMER, S. L. **Feeding of arsanic acid to pullets.** *Quart. Bull. Michigan Agric. Exp. Stat.*, 1953, **35**, 419-427. [Dept. Poultry Husb., East Lansing.]

See also Absts. 166, 381, 385, 1340.

OTHER BIRDS

1372

TUTTLE, J. W., CULTON, T. G., MACLAURY, D. W. and INSKO, W. M. (Jr.) **Sources and levels of protein in starting diets for bobwhite quail.** *Poultry Sci.*, 1953, **32**, 627-629. [Kentucky Agric. Exp. Stat., Lexington.]

Eight groups of 69 to 73 day-old quail chicks were given all-mash rations of the maize and soya

bean oilmeal type, containing as the protein source 26 per cent. soya bean oilmeal plus 14 per cent. fishmeal plus 5 per cent. dehydrated alfalfa meal; 48, 60 and 72.5 per cent. soya bean oilmeal; 47.5 per cent. soya bean oilmeal plus 9 per cent. meat scraps; 57.5 per cent. soya bean oilmeal plus 11 per cent. meat scraps; 47.5 per cent. soya bean oilmeal; 8 per cent. fishmeal; 57 per cent. soya bean

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plus 9.8 per cent. fishmeal. The average group liveweights were 94, 108, 109, 108, 109, 115, 106 g., respectively, at 6 weeks of age and the percentage of barebacks was 5.0, 25.7, 89.4, 86.4, 0.0, 87.7, 23.9 and 22.4, respectively. There was no difference in mortality between the groups.

M. J. Head.

1373

YAKSHIS, YA. YA. K voprosu ob izuchenii pitaniya khishchnykh ptits. [The problem of studying the nutrition of predatory birds.] *Zool. Zh.*, 1952, **31**, 948-950. [Kaf. Zool., Latvii Gosud. Univ.]

Using Folitarek's method (*J. Gen. Biol. USSR*, 1948, **9**, No. 1) for studying the diet of predatory

birds, in which a mask is placed on the young fledglings so as to collect scraps of the diet, observations were made of nests of eagles (*Aquila pomarina*) from which 16 objects of food were collected, and of buzzards (*Buteo buteo*), from which 504 objects were collected. From one nest, for example, 107 mammals, mainly voles and moles, 19 birds, 10 of which were larks, 6 reptiles and 15 amphibia were collected. Corresponding figures for another nest were 178, 29, 38, 105, the last being mainly frogs. It is considered that this method, in which none of the birds studied are killed, is superior to analysis of stomach contents.—W. Hughes.

See also Abst. 503.

FOOD ECONOMICS AND STATISTICS

1374

HEADY, E. O. and OLSON, R. O. **Mighell on methodology.** *J. Farm Econ.*, 1953, **35**, 269-276. [Bur. Agric. Econ., Iowa State Coll.]

A previous paper by Mighell (Abst. 5309, Vol. 23) is criticised under 3 headings: (1) methodological ideas, (2) assumptions on practical problems of most farmers, in reference to which the authors suggest that the situation where the farmer has a certain maximum capital which he can safely use and wishes to put to its most efficient use is more nearly the true situation than that in which the farmer wishes to know what expenditure on his part will give maximum returns, (3) defence of the authors' application of the equal product function to milk production.

A. W. Boyne.

1375

MIGHELL, R. L. **A further note on the equal-product function.** *J. Farm Econ.*, 1953, **35**, 276-280. [Bur. Agric. Econ., Iowa State Coll.]

A reply to the criticisms of Heady and Olson (see above Abst.)—A. W. Boyne.

1376

COMMONWEALTH ECONOMIC COMMITTEE. **Grain crops. A summary of figures of production and trade relating to wheat, wheat flour, maize, oats, barley, rye and rice.** H.M.S.O., London, 1953, pp. xxiii + 144. Price 5s. net.

1377

DEVELOPMENT COMMISSION. **A survey of agricultural, forestry and fishery products in the United Kingdom and their utilisation.** H.M.S.O., London, 1953, pp. 141. Price 7s. 6d. net.

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1378

MINISTRY OF AGRICULTURE AND FISHERIES, DEPARTMENT OF AGRICULTURE FOR SCOTLAND AND MINISTRY OF AGRICULTURE, NORTHERN IRELAND. **Agricultural statistics. United Kingdom, part 2. Output and utilisation of farm produce in the agricultural years 1943-1944 to 1949-1950.** H.M.S.O., London, 1953, pp. 46. Price 2s. 6d. net.

1379

WAUGH, F. V. **Food and supply prospects.** *Proc. Nat. Food Nutrit. Inst.*, December 1952; *U.S. Dept. Agric., Agric. Handbook* No. 56, 19-24. [Bur. Agric. Econ., U.S. Dept. Agric.]

1380

BLACK, J. D. **Food supply and prospects.** *Proc. Nat. Food Nutrit. Inst.*, December 1952; *U.S. Dept. Agric., Agric. Handbook* No. 56, 25-29. [Dept. Econ., Harvard Univ.]

1381

LENNARTSON, R. W. **Emergency food supplies.** *Proc. Nat. Food Nutrit. Inst.*, December 1952; *U.S. Dept. Agric., Agric. Handbook* No. 56, 103-107 (with discussion 107-108). [Prod. and Marketing Admin., U.S. Dept. Agric.]

1382

CHRISTIANSEN, J. E. **Irrigation in relation to food production.** *Agric. Eng.*, 1953, **34**, 400-406. [Sch. Eng. Technol., Utah State Agric. Coll.]

In this address to the American Society of Agricultural Engineers are given a historical survey of irrigation schemes in different parts of the world and a description of more recent developments, especially in the United States. The

part that irrigation is likely to play in increasing production is indicated, but such increases are likely to be at a greater cost than in the past.

D. Harvey.

1383

BAUM, E. L. and WALKUP, H. G. **Some economic implications of input-output relationships in fryer production.** *J. Farm Econ.*, 1953, **35**, 223-235. [Dept. Agric. Econ., State Coll. Washington.]

The economic implications of the nutritional requirements of table poultry are examined. Two aspects of the problem are considered: possible variations in the daily ration from full feed conditions, and optimum weights of birds at sale.

A knowledge of the functional nature of feed requirements and of the relation between the market value of table poultry and the price of poultry feeds is necessary when deciding whether table birds should at all times have as much food as they will eat. It is suggested that when the table poultry: feed price ratio is 5:1 it pays to give the birds all the feed they will take during the early stages of growth but when they approach 9 to 12 weeks of age they should be given less than that amount.

Table poultry are produced in lots, and information on the relation between feed intake and live-weight increases is normally obtained from sample data. It is shown that corrections must be made in order to use these data for policy decisions on pens of birds.

The market value of table poultry per lb. changes little with increase in weight. It is therefore important to know the selling weights which tend to maximise the total weight of poultry obtained from a given intake of feed. Graphs are presented showing the relation between the increasing weights and profits of birds (1) when the price of feed increases while the market value of table poultry remains unchanged and (2) when the value of table poultry falls while the price of feed remains constant.

Consideration is also given to the economic implications of using high energy feeds to which antibiotics have been added and the concluding paragraphs deal with the possible effect of some of the fixed costs on management decisions.

J. H. Smith.

1384

WESTERMARCK, N. Svenska Österbottens jordbruk och befolkningsförhållanden i social-ekonomisk belysning. [Agriculture and population in Österbotten, Sweden, in the light of social economics.] *Acta agral. fenn.*, 1945, **61**, 1-244. [Helsinki.]

This district of east Sweden has close links of history and population with Finland. The report

describes in detail the geography, climate and population of the area; the standard of living, including diet, household expenditure and type and cost of education, general and technical; the general economic situation in terms of land values, banking and taxation. It goes on to an equally detailed description of the distribution and use of land, types of soil, size of holding; man power and wages; the use of horses and tractors and all the practices of crop and animal production. The financial side covers marketing, cooperative movements, and cash incomes from forestry, seal fishing and fur animals, against expenditure and running costs. The last section deals with women's work.—I. Leitch.

1385

WYLLIE, J. **Financial results on the college farm. Results for three years, 1948-9 to 1950-1.** *Wye Coll., Dept. Econ. Rep.* No. 46, pp. 239-307.

This is an analysis of the principal farm enterprises with comparisons between the general farm policy before the war, immediately after the war and at the present time, the method of management and the yields obtained in relation to the economic and financial results.

E. L. B. Haskew.

1386

ASHE, A. J. **An economic analysis of large dairy farms, New York, 1949-50.** *Cornell Univ. Agric. Exp. Stat. Bull.* No. 887, January 1953, pp. 32. [Ithaca, N.Y.]

The data came from the records of 151 large dairy farms, average size 512 acres, of which 173 acres were in crops. The herds ranged from 41 to 246 cows, average 74.

Receipts from the sale of milk accounted for 67 per cent. of total receipts, as compared with less than 5 per cent. from the sale of crops. Feed, labour, equipment, and livestock accounted for 83 per cent. of the expenses. The average net cost of producing 100 lb. of 3.7 per cent. milk was \$4.10. Feed and labour accounted for 56 and 22 per cent., respectively, of the total cost. Labour efficiency increased as the number of cows per farm increased up to 100, but thereafter decreased.

The cost of producing 100 lb. milk was less in high-yielding herds than in low-yielding herds. Higher returns were obtained on farms where more than 50 per cent. of the milk was sold during the winter months. The conditions affecting costs and returns in producing milk are discussed in detail.

J. N. Aitken.

1387

GÉNIN, G. **L'industrie laitière dans le monde. [World milk industry.]** *Lait*, 1953, **33**, 275-283.

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1388

VAN DAM, B. **The economic importance of the Dutch dairy industry.** *Netherlands Melk Zui-
veltijdschr.*, 1953, 7 (Special issue), 21-32.
[Dairy Board, The Hague.]

1389

JONES, W. A. C. and IMPER, A. D. **Cattle costs—
summer 1952.** *North of Scotland Coll. Agric.
Econ. Rep.* No. 31, March 1953, pp. 11.

Records were collected for 53 groups of cattle, varying in size and composition, distributed throughout north and north-east Scotland; costs were calculated for the grazing period only. The cattle were mostly of the Aberdeen-Angus breed and its crosses, with a few pure Shorthorns and miscellaneous crosses. Taking into account the age and quality of the different grazings, the average net cost of grass was £5 4s. 1d. per acre, range £3 6s. 2d. to £6 7s. 4d. Animals graded off the grass were considered separately. They made an average gain of 2 cwt. and, at a total cost of £62 3s. 7d., left a net margin of £10 15s. 5d. per head for 16 weeks' grazing. This margin was much higher than in the previous year, owing chiefly to the rise in price per cwt. at slaughter. For cattle not finished on grass, 2-year-olds cost in all £51 19s. and one-year-olds £38 5s. 6d. per head by the end of the season. Because they were mostly on the cheaper grazings the cost of the 2-year-olds was 3s. 10d. and that of the one-year-olds 3s. 1d. weekly, for grass only, compared with 4s. 5d. for those graded off the grass.

The average grazing periods ranged from 16 weeks for those graded to 26 weeks for the younger animals.—W. Thomson.

1390

GODFREY, D. **Breeding cattle costs 1951/52.** *North of Scotland Coll. Agric. Econ. Rep.* No. 32, March 1953, pp. 16.

On 12 Caithness farms with an average herd of 16 cows the annual cost per cow was £30 2s. 3d. and per weaned calf £30 5s. On 12 upland farms and 7 lowland farms in the north of Scotland, of the same herd size, the respective costs were £32 2s. and £24 2s. 7d. per cow, and £31 7s. 10d. and £19 10s. 1d. per weaned calf; on 7 hill farms the herd average was 47 cows and the costs were £17 1s. per cow and £20 per weaned calf. Excluding subsidy, which was claimable in all except the lowland group, the margin of returns per weaned calf for the respective groups was —£3 6s. 8d., —£4 5s. 2d., +£6 15s. 7d. and +£3 14s. The range of costs and returns was wide, especially on the Caithness and upland farms. Costs on the lowland farms were lower,

chiefly because a larger proportion of cows suckled 2 calves. On the hill farms costs were least, chiefly because of lower feed costs, though calves were single-suckled and had the lowest valuation at weaning. The average number of calves reared in all groups was 84 per 100 cows. It is considered that the season was a good one and that this is one of the most important conditions influencing costs.—W. Thomson.

1391

PHILLIPS, R. and HUGHES, L. E. **Some aspects of losses in farm animals.** *Brit. Vet. J.*, 1953, 108, 458-472; 109, 33-38. [Dept. Animal Health, Univ. Coll. Wales, Aberystwyth.]

The information on which this paper is based was obtained from a number of sources, including reports issued by the chief veterinary officer of the Ministry of Agriculture, meat production records of the Ministry of Food and records of intakes into knackereries.

Particular reference is made to losses in the cattle population in the counties of Cardigan, Carmarthen and Pembroke. A study of the live-weights and gradings of all categories of cattle accepted on the hoof showed that three-quarters of the cows were in the lower grades (B and C), resulting in a substantial loss of potential beef. Cattle accepted as rejects and casualties represent a further loss.

Loss of condition during winter is considered an important source of loss, since part of the following summer grazing period is spent in making up the losses of the previous winter. The significance of the seasonal differences in intakes into 4 knackereries is discussed in detail.—J. N. Aitken.

1392

TERRILL, C. E. **The relation between sale price and merit in Columbia, Targhee and Rambouillet rams.** *J. Animal Sci.*, 1953, 12, 419-430. [U.S. Sheep Exp. Stat., U.S. Dept. Agric., Dubois, Idaho.]

The selling prices of 202 Columbia, 104 Targhee and 59 Rambouillet stud rams at public auctions from 1946 to 1951 were examined in relation to measures of merit. The highest correlation was between weight and price in yearlings. Correlations between price and grease fleece weight, clean fleece weight, type and condition were also significant. There was no constant relation between price and age. The results indicated that buyers attach real importance to production traits such as body and fleece weights and mutton conformation. It would be desirable to present more information on these lines at ram sales. This would facilitate improvement of flocks by selection.

T. D. Bell.

1393

BEYNON, V. H. **Bacon production from some home-grown foods.** *Agriculture, J. Minist. Agric. Engl.*, 1953, **60**, 206-210. [Dept. Econ., Univ. Bristol.]

The feed represents 80 per cent. of the cost of fattening a bacon pig. Estimated figures are

presented for fattening from 30 to 215 lb. live-weight on meal, or on a Lehmann system with potatoes or fodder beet. The use of roots does not impair carcass quality, and the saving per head was 17s. 4d. with potatoes and £2 11s. 4d. with fodder beet.—T. D. Bell.

See also Absts. 1045, 1046, 1285, 1326.

DIET IN ETIOLOGY OF DISEASE

GENERAL

1394

BEDDOWS, A. R. **Observation on hoove, hoven, blown, or bloat taken from agricultural writings, 1716-1827.** *J. Agric. Soc. Univ. Coll. Wales, Aberystwyth*, 1952, **33**, 12-15. [Welsh Plant Breeding Stat., Aberystwyth.]

1395

WESTCOTT, R. W., MOORE, G. R., CONNER, G. H. and RILEY, W. F. **Synthetic media powder to enhance rumen microfloral growth and activity: preliminary report.** *Vet. Med.*, 1953, **48**, 349-350. [East Lansing, Mich.]

The use of a synthetic rumen medium, "Profloran", of unstated constitution in the treatment of disorders of the rumen of cattle is described. The 139 cases treated are classified as traumatic gastritis, stasis and putrefaction in the rumen, impaction of the rumen, and inhibition of rumen flora by overdosing with molasses, sugars or sulphonamides.

All animals, except those in the last category, were subjected to laparotomy in order to remove foreign bodies or rumen contents. In some analyses fresh rumen contents from a donor animal were administered. "Profloran" was given to all animals and the opinion is expressed [with no objective data to support it] that in the 130 survivors recovery was more rapid than could have been expected without the administration of this material.—A. T. Phillipson.

1396

GÖTZE, R., AEHNELT, E. and FREESE, U. **Zur Methionintherapie bei Stoffwechsel- und Leber-Erkrankungen des Rindes.** [Methionine therapy of metabolic and liver disorders of cattle.] *Berl. Münch. tierärztl. Wochenschr.*, 1953, **66**, 219-222. [Klin. Geburtsh., Tierärztl. Hochsch., Hanover.] English summary.

Methionine by injection has been used in many widely different diseases of cattle and good results are claimed, explicable on the basis that, even when it has no direct effect, it protects the liver cells from damage.—I. Leitch.

1397

COLBORN, L. R. **Free fatty acids and rancidity in poultry feeding-stuffs.** *Vet. Rec.*, 1953, **65**, 579-580. [Nairobi, Kenya.]

It is suggested that heavy losses of chicks are caused by mashes containing rancid fats. Post-mortem examination reveals no conclusive signs, but there is generally evidence of acute digestive disturbance.

A survey of common constituents of mashes showed that rancidity, indicated by a high content of free fatty acids, developed readily, especially in products stored for several months, in Nairobi, where the mean temperature for the year often reaches 70° F. Attention to conditions of storage and rotation of stocks is recommended.

P. C. Jowsey.

See also Absts. 537, 560.

DEFICIENCY DISEASES

1398

STRUCK, M. **Die häufig bei Schlachtschweinen beobachteten pathologischen Leberveränderungen sind auf Eiweissmangel (Fütterungsfehler) zurückzuführen. [Pathological changes frequently seen in liver of pigs at slaughter are referable to protein deficiency (malnutrition).]** *Berl. Münch. tierärztl. Wochenschr.*, 1953, **66**, 257-259. [Zentralschlachthof, Hamburg.] English summary.

Veterinary inspectors are familiar with pathological livers in pigs at slaughter, showing all degrees of change from incipient hepatitis to advanced cirrhosis. On the basis of work with other animals and man, these are attributed to protein deficiency, especially deficiency of sulphur amino-acids.—I. Leitch.

1399

STEWART, J. **The effects of cobalt deficiency on the appetite of lambs.** *Brit. J. Nutrition*, 1953, **7**, 231-235. [Moredun Inst., Gilmerton, Edinburgh 9.]

Four sets of paired lambs were given a cobalt-deficient ration. One of each pair received a supplement of 10 mg. Co weekly but feed intake was restricted each day to the amount eaten by

N.A. and R., January 1954

the other member of the pair on the previous day. Each pair of lambs made almost the same weight gains and gained much less than control lambs given Co and fed to appetite.—F. C. Aitken.

1400

KEENER, H. A., PERCIVAL, G. P. and MORROW, K. S. **Cobalt treatment of a nutritional disease in New Hampshire dairy cattle. A preliminary report.** *Univ. New Hampshire Agric. Exp. Stat. Circular* 68, September 1944, pp. 8. [Durham, N.H.]

This reports the progress of the first year of investigation of a wasting disease of cattle prevalent in Carroll County, known locally as "Burtonail". Cobalt treatment of a number of cases met with remarkable success; there was immediate improvement in appetite, followed by great improvement in condition. For prevention or cure of slight cases a mixture of $\frac{1}{2}$ oz. Co sulphate with 100 lb. salt is recommended. For severe cases a dilution of 1 oz. Co sulphate in 1 gal. of water is recommended, mature animals being given 1 tablespoonful daily or 3 tablespoonfuls twice weekly for one or two weeks and then given access to the salt-cobalt mixture. Calves severely affected should be given 2 teaspoonfuls daily or 6 teaspoonfuls twice weekly for the first 2 weeks, followed by 1 teaspoonful daily until the animal is old enough to eat the salt-cobalt mixture.

E. L. B. Haskew.

1401

OHMAN, A. F. S. **Suspected copper deficiency of cattle in Fiji.** *Fiji Agric. J.*, 1952, 23, 94.

1402

PÁLSSON, P. A. and GRÍMSSON, H. **Demyelination in lambs from ewes which feed on seaweeds.** *Proc. Soc. Exp. Biol. Med.*, 1953, 83, 518-520. [Inst. Exp. Pathol., Univ. Iceland, Keldur, Reykjavik.]

Incoordination of movement characterises a disorder in lambs of ewes feeding on seaweed in late pregnancy. Demyelination confined to the cerebrum was found. Cu intake was adequate, but blood Cu in ewes from affected areas was only 0.2 compared with 1.0 mg. per litre in blood of ewes from unaffected areas. The Cu content of oven-dried livers of affected lambs was 7 p.p.m. compared with 140 to 210 p.p.m. in lambs from unaffected areas. A Cu supplement given to the pregnant ewes largely prevented the disorder.

J. C. Gill.

1403

WALSH, T. and O'MOORE, L. B. **Excess of molybdenum in herbage as a possible contributory factor in equine osteodystrophia.** *Nature*, 1953, 171, 1166. [Soil Lab., Vet. Res. Lab., Dept. Agric., Ireland.]

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On 12 farms where clinical rickets had been investigated in one or more foals or yearlings, the molybdenum content of the herbage was found to be within the range from 5 to 25 p.p.m. The soils on the farms in question were mainly derived from limestone and were similar in type, manurial treatment and management to those on which a Cu deficiency conditioned by Mo was identified (Abst. 1155, Vol. 23).—A. N. Worden.

See also Absts. 355, 356, 429, 431, 541.

DISEASES OF METABOLISM

1404

JOHNSON, R. B. **A theoretical discussion of ruminant ketosis.** *Amer. J. Vet. Res.*, 1953, 14, 366-375. [Live Stock Sanitary Serv. Lab., Maryland State Board Agric., Univ. Maryland, College Park.]

1405

LARSEN, P. L. Bidrag til acetonaemiens aetiologi og terapi. [Etiology and treatment of acetonaemia.] *Nord. Vet.-Med.*, 1953, 5, 559-566. English and German summaries.

Of 13 cows with acetonaemia, more than 8 days after calving, 11 were cured by 50 to 100 units of ACTH in a single subcutaneous injection.

I. Leitch.

1406

SCHULTZ, L. H. **Further studies on the use of sodium propionate in the control of ketosis in dairy cattle.** *J. Dairy Sci.*, 1953, 36, 597. *Proc.* [Cornell Univ., Ithaca, N.Y.]

1407

PARR, W. H. and ALLCROFT, R. **The production of tetany in calves fed on milk diets.** *Proc. Nutrit. Soc.*, 1953, 12, vii-viii. [Minist. Agric., Vet. Lab., Weybridge, Surrey.]

POISONS OCCURRING IN FOOD

1408

HARVEY, J. M. **Chronic endemic fluorosis of Merino sheep in Queensland.** *Queensland J. Agric. Sci.*, 1952, 9, 47-141. [Biochem. Sect., Chem. Lab., Div. Plant Indust.]

The indirect effects of chronic endemic fluorosis in certain areas in Queensland present a serious problem. The literature on fluorosis is reviewed and the distribution of fluoride waters where endemic fluorosis occurs is indicated and the areas are described. There is no district where the water contains more than 10 p.p.m. F.

Experiments were made with Merino ewes drinking water with 5 or 10 p.p.m. F. There was no increase in the F content of the milk, and no evidence that the high intake by the ewe was reflected in a high level in the foetus, so that

maintenance of the ewe in these areas could not have a harmful effect on the suckling lamb. Fleece weight and quality are affected only indirectly by fluorosis when the animals cannot graze properly because of bad teeth, and under the experimental conditions reported, when the feed was chaffed, in contrast to the normal somewhat coarse pasture, no effect of high F intake on the fleece was observed after 2 years. Storage of F in the edible portions of the carcass was not sufficient to constitute any danger to man. The effects of diets high in protein, Ca or P were investigated but, contrary to results obtained by other workers with laboratory animals, they had no mitigating effect on the development of fluorosis.

No practical method of removing fluoride from the waters under investigation was found, and the only advice is that management must play a major part in the elimination of chronic endemic fluorosis. Since it is during early life that the ill effects of high F intake are most marked, young sheep should be given water with a comparatively low F content, i.e., surface waters or supplies from as near the borehole as possible. The pasture along the irrigation channels has a high F content, and this must be kept in mind in managing the stock and changing grazing areas.

The teeth and bone lesions associated with fluorosis in Merinos are described and illustrated, but the latter do not agree with the reports of other workers, rarefaction rather than thickening of the mandibles and long bones being observed.

T. D. Bell.

1409

CUNNINGHAM, H. M., BROWN, J. M. and EDIE, A. E. Molybdenum poisoning of cattle in the Swan River Valley of Manitoba. *Canad. J. Agric. Sci.*, 1953, **33**, 254-260. [Dept. Animal Husb., Cornell Univ. Agric. Exp. Stat., Ithaca, N.Y.]

Signs of molybdenum poisoning similar to those reported by Ferguson *et al.* (Abst. 2240, Vol. 10) have been found in cattle grazing in the Swan River Valley. The herbage was found to contain up to 25.6 p.p.m. Mo as compared with 1.9 p.p.m. in the herbage of similar areas nearby where the trouble did not occur. The toxicity was overcome by administering 2 g. Cu sulphate daily as a drench or a salt lick. Administration of Co as sulphate was of no benefit. The disorder was produced experimentally in cattle by drenching with ammonium molybdate, but considerably more Mo than was found in the toxic forage was required to induce the disorder in cattle fed indoors. There was some evidence that cows may transmit the disorder through their milk to calves but it appeared that the cow was soon able to build up a resistance to the passage of ingested Mo into the milk.—W. Godden.

1410

HATHAWAY, I. L. and CHESNIN, L. Nitrate poisoning in cattle and the use of ammonium nitrate as a pasture fertilizer. *J. Dairy Sci.*, 1953, **36**, 583-584. *Proc.* [Univ. Nebraska, Lincoln.]

1411

LEIGHTON, R. E., ANTHONY, W. B., HUFF, J. S. and RUPEL, I. W. Relation of breed and free gossypol levels to cottonseed meal toxicity in dairy calves. *J. Dairy Sci.*, 1953, **36**, 601-602. *Proc.* [Texas Agric. and Mech. Coll., College Station.]

1412

MURNANE, D. The toxicity of *Atalaya hemiglauca* ("Whitewood") for horses. *Austral. Vet. J.*, 1953, **29**, 188-190. [Div. Animal Health and Prod., C.S.I.R.O., Animal Health Res. Lab., Parkville, Va.]

1413

GIBBONS, W. J., DURR, E. H. and COX, S. A. An outbreak of cirrhosis of the liver in horses. *North Amer. Vet.*, 1953, **34**, 556-558. [Sch. Vet. Med., Alabama Polytech. Inst., Auburn.]
Horses which had eaten *Crotalaria spectabilis* developed cirrhosis of the liver and died up to 6 months after being removed from the pasture containing the plant.—P. C. Jowsey.

1414

COOK, L. J. The story of *Phalaris tuberosa* in South Australia.
SMITH, W. S. *Phalaris* staggers in South Australia.
1. Its distribution.
SYMONS, L. E. A. 2. A description of two particular outbreaks.
SMITH, W. S. 3. The symptoms of *Phalaris* staggers and its differential diagnosis.
LEE, H. J. The course of the disease. *J. Dept. Agric. S. Austral.*, 1953, **56**, 431-437.

1415

EVELETH, D. F. and GOLDSBY, A. I. Toxicosis of chickens caused by trichloroethylene-extracted soybean meal. *J. Amer. Vet. Med. Assoc.*, 1953, **123**, 38-39. [Dept. Vet. Sci., N. Dakota Agric. Exp. Stat., Fargo.]

Of 103 day-old chicks fed on a chick mash containing trichloroethylene-extracted soya bean oilmeal 27 died within 49 days. Of a similar number of controls given hexane-extracted meal only 5 died. Among the survivors, susceptibility to pseudomonas, pasteurella and coccidiosis infection was greater in those receiving the trichloroethylene-extracted meal.—J. S. Thomson.

IMMUNITY

1416

STEWART, D. F. and GORDON, H. M. **Studies on resistance of sheep to infestation with *Haemonchus contortus* and *Trichostrongylus* spp. and on the immunological reactions of sheep exposed to infestation. 6. The influence of age and nutrition on resistance to *Trichostrongylus colubriformis*.** *Austral. J. Agric. Res.*, 1953, 4, 340-348. [Div. Animal Health and Prod., C.S.I.R.O., McMaster Animal Health Lab., Sydney.]

The influences of age, nutrition and previous infestation on the resistance and antibody response of sheep artificially infested with *Trichostrongylus colubriformis* were studied. Resistance was measured by egg counts and the circulating antibody level was measured by the complement fixation method.

In the first experiment 3- and 4-year-old sheep which had been kept worm-free since birth were dosed with *T. colubriformis* larvae; no difference in resistance or antibody response between these age groups was found.

In the second experiment 48 nine-month-old lambs which had been exposed to infestations in the field were brought in and dosed with phenothiazine. They were divided into 3 dietary groups; high-protein, starch equivalent 53 per 100 lb., total protein 20 per cent.; normal, S.E. 56, T.P. 10, and poor, S.E. 34, T.P. 6. The sheep were dosed with *T. colubriformis* larvae after 3 months on this diet. Eight of the 16 on the poor diet developed heavy infestation, compared with 2 in each of the other 2 groups. Diet did not greatly affect the antibody response. Ten sheep on the poor diet and 14 on each of the other 2 diets developed similar levels of circulating antibodies. Twelve of the sheep on the poor diet were

given a further challenge dose of 200,000 larvae, which they all resisted except one. Thus the continued low diet did not appear to lower the resistance of sheep which had had previous infestations of *T. colubriformis*.

In order to test whether nutrition had an important effect on the response of sheep to their first infestation, a similar experiment was made with lambs which had been born and reared in a worm-free environment. Only 2 dietary groups were used, high-protein and poor. The lambs were infected when 8 to 9 months old, after 10 weeks on the experimental diets, and both groups developed infestations. The egg counts were slightly higher and persisted a little longer in the poorly-fed group. Six on the high-protein diet and 7 on the poor diet showed serological responses. These lambs resisted further doses of larvae given 5 months after the initial infestation.—G. C. Hunter.

1417

PRICE, D. A., HARDY, W. T. and BOUGHTON, I. B. **Phenothiazine-salt mixture for control of *Haemonchus contortus* in range sheep.** *J. Amer. Vet. Med. Assoc.*, 1953, 123, 132-135. [Sonora, Tex.]

The use of a 1:9 phenothiazine-salt mixture as an alternative to drenching for controlling *Haemonchus contortus* in range sheep was tested over a period of 7 years. The ewes and their lambs had free access to the mixture; the controls, in a similar adjoining pasture, were supplied with white salt only. Observations were made on egg counts, worm counts at autopsy and larval development. The data collected seemed to show that the phenothiazine-salt mixture controlled *H. contortus* satisfactorily throughout the period of the experiment.—G. C. Hunter.

See also Absts. 295, 504, 1415.

7. BOOK REVIEWS

1418

CONN, H. J. and DARROW, M. A. (Eds.) **Staining procedures used by the Biological Stain Commission.** Biotech. Publications, Geneva, N.Y., 1946.

1419

MRAK, E. M. and STEWART, G. F. (Eds.) **Advances in food research. Volume 4.** Academic Press, Inc., New York, 1953, pp. xiii + 457. Price 72s.

1420

WALLACE, T. and MARSH, R. W. (Eds.) **Science and fruit.** Univ. Bristol, 1953, pp. xiii + 308. Vol. 24, No. 1

1421

SEXTON, W. A. **Chemical constitution and biological activity.** E. and F. N. Spon, Ltd., 22 Henrietta St., London, 1953, 2nd revised ed., pp. xxiii + 424. Price 60s.

In the review (Abst. 1262, Vol. 20) of the first edition of this valuable book the hope was expressed that supplements or new editions would appear regularly "to keep the reader abreast of the very rapid advance of the subject". Now, after only 4 years, the author has fulfilled this hope. The need for a new edition as a result of advances in knowledge is clearly indicated by the fact that considerable alterations have been made in 5 chapters; a further chapter, that dealing

with insecticides and anthelmintics, has been extended and revised as a whole; the chapters on cancer and plant growth regulators have been rewritten. The tribute paid earlier to the author and the first edition is equally applicable to the present edition. It is excellently produced and well supplied with references to the literature and has an adequate subject index.—W. Godden.

1422

LUCK, J. M., LORING, H. S. and MACKINNEY, G. (Eds.) **Annual review of biochemistry. Volume 22.** Annual Reviews, Inc., Stanford, Calif., 1953, pp. ix + 729. Price 48s.

1423

SUMNER, J. B. and SOMERS, G. F. **Chemistry and methods of enzymes.** Academic Press, Inc., New York, 1953, 3rd ed. revised and enlarged, pp. xvi + 462. Price 60s.

1424

PINCUS, G. (Ed.) **Recent progress in hormone research. The proceedings of the Laurentian Hormone Conference. Volume 8.** Academic Press, Inc., New York, 1953, pp. 603. Price 86s. 6d.

1425

MASSINGHAM, H. J. and HYAMS, E. **Prophecy of famine. A warning and the remedy.** Thames and Hudson, London, 1953, pp. 192. Price 12s. 6d.

It is the authors' considered opinion that Britain will not be able to go on importing about half her food. Countries from which food supplies are obtained will either cease to have exportable surpluses or will no longer require the manufactured goods which Britain now sells to pay for imports of food. There is also the possibility of war cutting off supplies even before the first two situations materialise. In short, Britain will starve, and that quite soon. This thesis is developed in Chapter 1 by Mr. Hyams. In the second chapter he gives data on imports and sources of supply. The third chapter, entitled "The Abuse of Land", shows some of the reasons for such dependence on imports; the diversion of agricultural land to other uses such as housing, industrial purposes, sport, roads is deplored and the conifer policy of the Forestry Commission is criticised as unecological. This chapter by Mr. Massingham is followed by some of Mr. Hyams's ideas on how the gap between requirements and present home production could be narrowed by changes in agricultural policy. These include the ploughing up of much permanent pasture to increase cereal production, the reclamation of rough grazing for beef animals, and the cutting of

liquid milk consumption by half to increase supplies of butter, cheese and incidentally bacon. At this point one becomes doubtful of the soundness of Mr. Hyams's nutritional basis for his planning, when he says on page 79 "Milk is, of course, a perfect food for infants, but the digestion of an infant differs from that of an adult, and raw milk for all above the infant age is not particularly easy to digest", and further, "most children dislike milk and much of that forced on the poor creatures is wasted". Such doubts harden into certainty when one reads on page 90 that according to Mr. Hyams vitamins A and D are plentiful in blackcurrants, apples and oranges and that Mr. Hyams would substitute home-produced blackcurrant juice and apple juice for orange juice as a welfare food. Even if a slip of the pen accounted for Mr. Hyams writing vitamins A and D instead of vitamin C we have yet to account for his error in thinking apple juice is a good source of vitamin C.

In the fifth chapter Mr. Massingham again takes up the subject of the use of land and describes how land may be used to better advantage. This leads him to his main conclusion that Britain can only use her land to the best advantage by becoming a nation of peasant farmers. Only in this way can the land be used efficiently enough for Britain to become self-supporting. This theme is developed in Chapter 6. Mr. Massingham's contribution to the book ends with Chapter 8 entitled "A Self-supporting Soil", in which he discusses the building up of soil fertility, especially with organic material compost, sewage sludge and the like.

Mr. Massingham died before the remaining Chapters 7 and 9 were written by Mr. Hyams. In these, land nationalisation is advocated as a means of establishing a modern peasantry, the state to act as did the good lord of the manor in earlier peasant communities. Mr. Massingham's wife in a preface dissociates her late husband from such a political solution. Be that as it may, the authors were agreed that Britain could feed her population only by becoming a nation of small peasant farmers and suggest that by suitable education the people could become such a peasant population.—F. C. Aitken.

1426

HARRIS, C. F. **Handbook of dietetics for nurses.** Baillière, Tindall and Cox, 7-8 Henrietta St., London, 1953, pp. xv + 196. Price 17s. 6d.

The author, who is chief therapeutic dietitian at University College Hospital, has aimed at emphasising the connection between good health and correct feeding, and the first half of her book is appropriately devoted to the nutrition of the healthy. At the outset the functions of individual

nutrients and the basic facts on digestion and absorption are recounted briefly; in places the treatment is scrappy, *e.g.*, that of the more recently recognised B vitamins. Next come energy and nutrient requirements in health, with tables of the U.S. and British Medical Association recommended allowances and a nomogram for calculating individual energy requirement from height, weight, age and sex. The characteristics of common foods and the effects of cooking on them are discussed in detail; a table of nutrients supplied by common foods per oz. edible portion is included. Chapters follow on diet in pregnancy and lactation and on the feeding of infants, including premature infants, and young children, with specimen diets.

The second half of the book opens with a description of the principal deficiency states, with photographic illustrations. The remaining chapters deal with special diets for diseases of the alimentary tract, liver and kidneys, cardiovascular disorders, rheumatic disorders, gout, diabetes, obesity, leanness and starvation, and some other conditions. All these are explained in detail, with specimen diets and lists of suitable foods and foods to be avoided.

The book is very clearly printed and opens flat.
W. M. Deans.

1427

CUTTING, W. C. and NEWMAN, H. W. (Eds.) **Annual review of medicine. Volumes 3, 4.** Annual Reviews, Inc., Stanford, Calif., 1952, pp. ix + 442; 1953, pp. ix + 452. Price 48s. each.

1428

BRANDLY, C. A. and JUNGHER, E. L. (Eds.) **Advances in veterinary science. Volume 1.** Academic Books, Ltd., London, 1953, pp. xi + 431. Price \$9.

This volume forms the first of a series designed to review progress in veterinary research and the practical application of new veterinary knowledge. Information is offered under 8 chief headings, each with separate authors, but it is disappointing to find that the selection and arrangement of these main sections has resulted in considerable overlapping and repetition. These faults are par-

ticularly noticeable in the chapters on animal diseases and human welfare, and veterinary public health.

In some instances, too, the subject matter leaves much to be desired. Some of the advances described can in no sense be considered recent, and much recent work published in countries other than the United States is totally ignored. Indeed, despite the appointment of a distinguished and international Advisory Board, there is a distinct American bias throughout the whole work. Bovine tuberculosis, for instance, which has for long been a serious scourge in almost every country in the world except the United States, is dismissed in little over a page. By contrast, however, work on bovine mastitis, the antibiotics and the sulphonamides is very capably and fully reviewed. Other chapters deal with virus diseases, diseases of pigs and infertility in cattle.

There is little in this first volume of direct interest to the specialist in animal nutrition, apart from a discussion of "yellow fat" disease in pigs and a review of the part played by nutrition in bovine infertility. A comprehensive review of this latter subject is badly needed to-day, but unfortunately the subject is very incompletely covered. Only one reference is quoted in regard to the part played by trace minerals in reproduction, and only two to the possible influence of phosphorus deficiency; consequently these receive a disproportionate amount of attention and the picture presented is unbalanced.

No doubt in a volume of this broad scope superficial treatment of many important points is inevitable. It is not claimed, of course, that the reviews are exhaustive, but one wonders whether the concept of the series is not too wide and whether it would not have been more useful to have narrowed the horizon and at the same time widened the treatment of individual questions, particularly those involving highly controversial issues. As it is, the approach to many of the subjects considered is too academic for the practitioner and too incomplete for those engaged in research.—W. A. Greig.

8. FOOD AND AGRICULTURE ORGANIZATION (AND OTHER ORGANIZATIONS) OF THE UNITED NATIONS

Development Paper No. 35. Co-operative hybrid maize tests in European and Mediterranean countries— 1951. Rome, Italy, September 1953, pp. v + 145. Price \$1.50.

Commodity Reports. Fats and Oils No. 5. Rome, Italy, October 1953, pp. 61. Price \$0.25.

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On statistics and information available to September 1953 it is concluded that world production per person is now only slightly below pre-war level and that, compared with pre-war, consumption per person has increased substantially in Latin America, Africa and some Asian countries and decreased slightly in Western Europe, United States and Canada. Should there be no major

changes in world economic activity or in international political conditions, the general levels of prices in international markets of fats, oils and oilseeds are expected to remain about the same in 1953 to 1954 as in 1952 to 1953 or to decline only slightly.

Monthly Bulletin of Agricultural Economics and Statistics.

Vol. 2, No. 9, September 1953, pp. 56. Review of current agricultural plans and programs in Latin America. No. 10, October 1953, pp. 48; No. 11, November 1953, pp. 56.

The Work of FAO, 1952-53. Report of the Director-General. Rome, Italy, October 1953, pp. 46. Price \$1.00.

The Director-General recalls how, soon after its foundation in 1945, FAO, the first of the "action agencies" of United Nations, was confronted with the problem of food shortages. With the passing of these its activities can now be grouped in two categories, the provision of an intelligence service to Member Nations and the framing of programmes to supplement those initiated by governments. The present report refers to the many ways in which the Organization has implemented these. In animal nutrition, deficiencies of P in Mexico and of I in Ecuador have been reported and in human nutrition especial interest has been taken in the composition of foods and the protein nutrition of children. In its aiding activities in animal nutrition, pasture management and national feeding resources were discussed at meetings in America and France. In human nutrition, supplementary feeding experiments were made in Belgian Congo and French Equatorial Africa with skimmed milk and, in other countries where increased milk supplies are not readily available, with soya bean products in Asia and refined fishmeal in South America. A final section summarises the Organization's informational and educational services.

Activities of FAO under the Expanded Technical Assistance Program. 1952-53. Rome, Italy, October 1953, pp. 88. Price \$1.00.

A summary is given of the investigations made since the Program was approved by the General Assembly in December 1949. In three years more than 2000 experts have assisted in the economic development of 82 countries and territories. This picture of their achievements has a regional background.

Agriculture in Asia and the Far East. Development and Outlook. Part 1. Report of the FAO Regional Meeting on food and agricultural programs and outlook in Asia and the Far East, held in Bangalore, State of Mysore, India, 27 July-5 August 1953. Part 2. Working paper prepared by FAO for discussion at the Regional Meeting and revised in the light of additional information furnished at the Meeting. Rome, Italy, September 1953, mimeographed, pp. iv + 221, n.p.

Asia and the Far East as a region provides the "hard core of the world's food problem" and to the conference there came, for the first time, ministers and policy-makers of the governments of the region. Their report and 10 resolutions are published in full.

The working paper which in its revised form will be the basis, for that part of the world, of the review at the 7th Session of the FAO Conference, gives a detailed analysis of the food shortages and of targets and estimates of agricultural and livestock production and improvement. Reference is made also to fisheries development and to problems in forestry and the use of forest products. Although the prospects in most of the territories are of a rise in production which will result in more calories being available in 1956 to 1957 there are indications in others, notably Ceylon, that current levels may not be attained. Qualitative deficiencies as, for example, in protein call for increased milk production or, if this be not feasible, for development of fisheries or in production of cheaper protective foods of vegetable origin. The question of animal feeding is a critical problem and the heavy pressure of human and livestock populations on land resources will require the integration of both if the production of feedingstuffs for animals is not to conflict with that of human food.

Prospects for agricultural development in Latin America. Rome, Italy, n.d., mimeographed, pp. v + 146. Price \$1.00.

This publication reviews developments in relation to the discussions which took place at the FAO Latin-American Regional Meeting on Food and Agricultural Programmes and Outlook held in Montevideo in 1950 and to the production targets and estimates for the year 1956-57.

The plans and programmes of the individual states are reviewed. Of the expansion schemes those in irrigation may make some contribution towards attaining objectives but the parts to be played by colonisation, improved soil management, use of fertilizers and schemes for plant protection are likely to be small. Greater efforts will be required from governments in schemes for seed and livestock improvement and for extension services. Mechanisation has made great strides but for many years the basic problem will be that of supplying power-operated equipment to small and medium-sized farms. Development of fisheries has been checked by high prices and by the indifference of consumers who prefer meat and poultry but there seems no reason why targets should not be reached. Of the economic measures price policy is beyond control by being dependent on international agreement but farm credit schemes with capital, which, it appears, will have to come from domestic sources, could contribute largely to the solution of the problems of agricultural expansion.

FAO Fisheries Bulletin. Vol. 6, No. 5, September-October 1953, Rome, Italy. Price 30 cents, pp. 159-193. Improving the fisheries contribution to world food supplies.

The relation of the production during 1950 to 1952 to pre-war level and to the 1960 target of the Second World Food Survey is considered. Present production is mainly from waters adjacent to land masses in the Northern Hemisphere. The 6 major producing countries of the world produce 61 per cent. of the world's total production for the period and there was evidence that, in the last 40 years, they have more than doubled their catches. Increased production has in some areas, e.g., Europe and North America, resulted from advances which have

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solved the problems of distance while in others, *e.g.*, Japan and Norway, it has followed the more complete exploitation of coastal resources.

The bases of possible expansion are considered in detail with special reference to increased productivity and the technical requirements for its realisation and an appraisal of their possible effects leads to the conclusion that the world's aquatic resources could yield much greater quantities of human food than they do at present.

Deterrents do, however, exist in the form of certain weaknesses in the economic system as it concerns the producers, in an ineffective demand and in the lack of organisation and finance in the industry. These and other conditions which have a limiting effect on developments are dealt with fully.

9. DEPARTMENTAL AND OTHER REPORTS

UNITED KINGDOM.

National Institute for Research in Dairying, University of Reading. Report for the Year 1952. Pp. 127.

Antibiotics for fattening pigs.
Nutritive value of sow's milk (rat).
Factors affecting efficiency of feed utilisation by ruminants: influence of level of roughage in the ration on fat content of milk.
Nutritional significance of colostrum.
Stimulation of milk production in the cow by thyroid-active substances.
Oestrogens in grassland herbage and their possible effect on milk secretion.
Endocrine control of mammary gland.
Physiology of the udder.
Nutritional role of the micro-organisms of the alimentary tract.
Composition of sow's colostrum and milk.
Composition of butterfat on low-roughage, high-concentrate rations.
Effect of adding methionine to casein and effect of level of protein intake and of age of rat.
Biological value of proteins of bacteria and protozoa from bovine rumen (rat).
Effect of vitamin B₁₂ on utilisation of protein (rat).
Evaluation of nutritive value of proteins by analysis of livers (rat).
Vitamin synthesis in the ruminant.
Vitamin B₁₂ activity of gut contents and faeces.
Gut synthesis of vitamin B₁₂ in the rat.
Preformed vitamin A, and provitamin pigments, in marine invertebrates.
Mode of action of antibiotics in stimulating growth.
Vitamin content of sow's milk.

CANADA.

Fisheries Research Board of Canada. Annual Report for the Year 1952. Pp. 231.

Utilisation of residues from manufacture of cod liver oil.
Vitamin content of fish flesh.

INDIA.

Indian Council of Medical Research, New Delhi. Technical Report of the Scientific Advisory Board for the Year 1952. Pp. 387.

Nutritional Research Laboratories, Coonoor.

Vitamin A: Fluorimetric method of estimation. Vitamin A deficiency and the pigment epithelium of the retina (monkey).

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Riboflavin: biosynthesis in caecum, effect of fat intake (rat).

Vitamin D: effect on rachitic cartilage (rat).

Nutritive value of duck egg white (rat): trypsin inhibitor in duck egg white.

Partition of urinary nitrogen on vegetable and animal protein diets (man).

Plasma lipase and esterase in nutritional oedema (children). Carbon tetrachloride liver injury and the role of S-containing amino-acids (rat).

Nutritional oedema: body composition, disturbances in electrolyte metabolism, pathogenesis and histopathological changes (man).

Vitamin B₁₂ and growth in undernourished children.

University College of Science and Technology, Calcutta.

Biosynthesis of ascorbic acid (rat).

Vitamin C and tyrosine metabolism (guineapig).

Nicotinic acid. Isolation of bound form from rice bran and distribution in cereals.

Metabolism of iron during the embryonic development of the hen's egg.

Effect of canning and storage on the nutritive value of some Indian vegetables.

Vitamin B₁ content of some pure strains of cereals and pulses.

Losses of nutrients of rice during cooking.

Seth G.S. Medical College, Bombay.

Nutritive value of purebred cereals and pulses.

National Chemical Laboratory of India, Poona.

Effect of diets containing low levels of dietary protein on growth, N balance, Hb, basal metabolism and oestrous cycle in third generation rats.

All-India Institute of Hygiene and Public Health, Calcutta.

Metabolism of vitamin A: properties of vitamin A aldehyde-albumin complex (rat).

Estimation of sodium and potassium in Indian foodstuffs.

Presidency College, Madras.

Isolation of the combined nicotinic acid in fish muscle.

Co-enzyme and combined nicotinic acid.

Nicotinic acid metabolism of rabbits: 6-pyridone as major end product.

Department of Chemical Technology, University of Bombay.

Effect of formate on creatine metabolism in folic acid deficiency.

Effect of excess nicotinamide on liver lipids of normal and folic-acid-deficient rats.

Folic acid and labile methyl synthesis.

Effect of folic acid and aminopterin on xanthine oxidase synthesis *in vitro*.

Biogenesis of folic acid and citrovorum factor by *Lactobacillus arabinosus*.

Indian Dairy Research Institute, Bangalore.

Digestibility and biological value of the mixed proteins of milk and dairy products.

Estimation of vitamin A, B₁ and C and riboflavin and nicotinic acid in milk and milk products.

Biochemical Laboratory, University of Madras.

Enzymic role of inositol.

Medical College, Baroda.

Digestion, evacuation time and gastric response to various Indian food preparations.

Presidency College, Calcutta.

Effect of vitamin A deficiency and excess on ascorbic acid, glutathione, cysteine, cystine, chondroitin sulphate of tissues and on tissue respiration (rat).

Safdarjang Hospital, New Delhi.

Effect of malnutrition on physique and blood picture.

Mahatma Gandhi Memorial Medical College, Indore.

Human requirements of riboflavin and vitamin B₁.

Institute of Science, Bombay.

Effect of autoclaving on the nutritive value of pulses (rat).

Assam Medical College.

Inquiry on B.M.R. in Assam.

Malaria Institute of India, Delhi.

Nutritional state and the effect on mammalian malaria.

Haffkine Institute, Bombay.

Role of nutritional factors in hepatic cirrhosis: vitamin E content of human milk.

UNITED STATES OF AMERICA.

**University of Florida Agricultural Experiment Stations.
Annual Report for the Fiscal Year Ending June 30,
1952. Pp. 310.**

Mineral requirements of cattle (Zn, Ca, P, Cu, Co, Fe).

Loss of nutrients in drip from defrosted frozen meat.

Utilisation of calcium and phosphorus by poultry as determined with radio-active isotopes.

Transfer of mineral elements through the placenta and their distribution in the foetus.

Post-partum development of bovine stomach compartments and observations on some characteristics of their contents.

Effect of aureomycin feeding on the performance of dairy calves.

Effect of dietary practices and previous illnesses on carpal development of children.

Effect of carotene or vitamin A deficiency in young rats on subsequent life pattern.

Nutritional deficiencies in the young rat in relation to subsequent malformation of bones.



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SECULAR CHANGE IN THE HEIGHT OF BRITISH ADULTS

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INTRODUCTION

IN the Foreword to a recent posthumous publication on the growth of children from birth to five years of age (Low, 1952) it is stated that "Professor Low profoundly disagreed with the current statement that children of today are taller and heavier. He maintained that, however excellent the nourishment received by certain children, they would not grow beyond the size of their type, and he was convinced that even if food was poor, provided a child got sufficient it would reach the stature for its particular stock." In vivid contrast to this we have the fact quoted in the Report of the Chief Medical Officer of the Ministry of Education for the years 1948 and 1949 (1952) that the mean height of 5-year-old boys in Wolverhampton rose by more than 4.5 inches and of girls by more than 6.5 inches between 1909 and 1949, and the analyses of secular changes in height and weight of schoolchildren in London by Menzies (1940) and Daley (1950), in Glasgow by Campbell and Weir (1948) and for several areas by Clements (1953), all showing substantial in-

creases at all ages since records were regularly made. Professor Low was no doubt right in his conviction that the maximum height to which any individual can attain is fixed by type, stock, or heredity, but it is equally sure that over the last 100 years a very high proportion of children in Britain were debarrred by disease and deformity from coming near to their potential upper limit. There are few who would deny now that the speed of growth has increased in parallel with the great improvements that have been made in hygiene, housing, medical care, diet and standard of living in general. It is still debated whether or not the increase in speed has meant increase in adult stature or merely earlier maturity. *A priori* it might be argued that, as the thousands of sick and crippled children of last century and the beginning of this century have been replaced, as they certainly have been, by well and progressively bigger children, the mean height of adults must have increased. American literature confidently reported increases in attained height of particular groups of population, even of high social class such as Harvard students (Shuttleworth, 1951). Danish

anthropologists kept track of the height of recruits and it is now taken for granted that there has been a general increase in height of the Danish population. It was therefore unexpected and disturbing when Morant in 1950, as part of a symposium on growth, read a paper to the Royal Society in which he presented an analysis of all the data he could assemble on height of British men and deduced that maximum mean height is attained earlier but is not greater than it was a hundred years ago, and that the price of earlier attainment is earlier decline. The contrast was so striking that we decided to re-examine the original reports.

THE MEANING OF MAXIMUM HEIGHT

The term maximum height covers two separate concepts and it is important to make and keep a clear distinction between them.

In the Individual

In the individual, growth in height continues, health and food permitting, certainly until the epiphyses of the long bones unite, but probably very little thereafter. According to older textbooks of anatomy, fusion of the epiphyses of the femur occurs at age 20. There must, as with any other biological end-point, be a distribution about a mean age of fusion, but whether age 20 is intended as a mean or as an upper limit does not appear. From the general nature of the material used for such studies, it is likely that age 20 would approximate to the upper limit for epiphyseal union in non-pathological subjects. According to Todd (1930) that estimate derives from the middle of last century and an extensive study under his direction gives 17.0 and 18.5 years as limits for epiphyseal union in boys for the femur, including both epiphyses, and the same limits for girls; for the tibia and fibula (distal only) 15.5 and 16.5 years for boys and a year earlier for girls.

That being so, it seems unlikely that much true growth would occur after age 20 at any time in the past century, and possible that any increase in measured standing height discovered within a few years after 20 could be caused by change in posture, the correction of a stoop, or merely improved tone of muscle or expansion of intervertebral discs induced by physical training (*cf.* below, Reid's students).

What happens to the individual later in life has not been studied and is a matter of "common knowledge" only. There is a vague general impression that, apart from the development of occupational stoop or other similar disability, there is little change until some undefined age usually placed anywhere between 50 and 65. The

age, the cause and the rate of shrinkage are all unknown.

In a Population

The application of statistical methods to the study of mortality and problems of public health in the beginning of last century had a natural sequel in the beginnings of the statistical study of man himself. William Farr was chairman of the Anthropometric Committee of the British Association from 1875 to 1879 and was succeeded by Francis Galton. The emphasis shifted from study of the individual to study of the group, with a tendency to treat data as if validity necessarily increased with the size of the group studied. The relatively recent application of statistics to biological and medical problems has brought a new awareness of the importance of study of the individual.

The mean maximum height of a sample of men, as estimated in practice from data grouped by age in some arbitrary fashion, may be defined as the mean height of all the men in the age-group which shows the greatest mean height, and the age of attaining mean maximum height as the mean age of the youngest age group to reach it. Other methods have been used (Morant, 1950). Mean maximum height may then be quite different from the mean adult height as will be apparent from the distribution of heights by age after age 20, as discussed and illustrated below.

The curve representing the distribution of heights by age after age 20 is a composite, varying with the nature of the samples used and subject to modification by a continuous process of weeding-out by death as age advances. When anthropometric records began over 100 years ago general mortality rates were very high. For details see Simon (1897) pp. 288 *et seq.* and the Registrar-General's Reports which he cites. Mortality in general improved steadily with improvement in economic conditions and, up to the end of the century, there was improvement in all age groups except the oldest and youngest. The youngest improved rapidly in the present century (Greenwood, 1936). Even now a social class gradient persists, greatly modified. There has also been throughout the last 100 years a social gradient in both rate of growth and attained maximum height. It follows that the older the sub-group of population measured, the more it will tend to represent the better-off and better-grown of the people born within the corresponding sub-period of the past century. Throughout the same time both expectation of life and attained height have been greater for rural than for urban populations.

Morant (1950) talks of maximum mean height but appears to operate only with the means of maxima of samples from different classes of the

population to give mean maximum height. There will probably be little difference in practice but the term maximum mean height implies a refinement of analysis which the data can ill carry.

DESCRIPTION OF THE RECORDS

The ideal material for a study of secular change in growth and maximum height of the population would be obtained from repeated measurements of samples of the whole population taken at intervals over the whole of life for the period under investigation. Instead of this, for adults we have no more than a limited number of cross-sectional samples of restricted and often undefined sections of the population at scattered intervals. The only investigation which recorded repeated measurements on a very small number of the same individuals recorded only weight (Kemsley, 1953). The position is much better for growth of school-children for whom periodic measurements since the School Medical Service began constitute an impressive series of partial replacement samples, but, so far, our assembly and analysis of these have not gone further than to confirm for Council school children the secular increase in rate of growth and in height attained at a given age.

Last Century

Among the earliest systematic works on anthropometry is that of Quetelet (1870) spanning the years from 1832 to 1870. His data were mostly of Belgian origin but he did handle some British. He was of the opinion that individuals of both sexes maintained their maximum height until the age of 50 years and by the age of 90 had lost 3 inches (wrongly quoted by Roberts as $1\frac{1}{2}$). As an illustration of the long standing of some "modern" views on growth, the following remarks by Quetelet in Roberts's translation are of interest. "In considering a particular individual, his growth is far from being as regular as that indicated in the tables. There are nearly always points at which the development of a person is arrested, as also there are times of growth more or less rapid. These anomalies are observed about the age of puberty and after illness. . . . When we look on a great number of persons these little anomalies disappear in the general means, and what is wanting in the development of one is compensated for by an excess of growth in another." The modern counterpart of this very cautious statement might be Tanner's (1951) assessment of the relative statistical value of cross-sectional, partly longitudinal or partial replacement, and purely longitudinal studies. Morant (1951) gives a brief chronological review of British data.

The influence of Quetelet can be seen in the work of Beddoe (1870) and Roberts (1878). Beddoe should receive homage as the first to make a major attempt at measuring the adult male population of these islands. The age limits he set, guided, he said, by Quetelet and others, were 23 years to 50 years of age on the assumption that maximum stature had been attained on the average by 23 years of age, and that people aged from 23 to 50 all had the same average height. Beddoe himself had the impression that a decrease began rather before than after fifty but conceded that his impression might have been biased by hospital experience. His records came from four sources: (1) private returns, mostly from rural doctors, (2) records of heights of criminals, (3) returns from most county asylums, and (4) returns of volunteers for the army for two years during which the qualifying height was 65 inches.

In his paper (1870) the data from the first three sources are presented at length, and the military data are classified by occupations and subdivided regionally.

He was aware of the difficulties to be met in the effort to obtain a fair sample of the population or of a particular class, but believed that his private returns, with a few exceptions, succeeded in doing this. On the question of accuracy of the measurements he stated that "one man is content with less exactitude in these matters than another", but no mention was made of his own omission to give specific directions for measuring stature.

Of the data for recruits he has to say that, within regions, differences in stature existed between different occupations. These differences, he says, "are in truth vastly less than they would have been, had there been no minimum standard. It is obvious that the lower the average stature in any trade, the greater will be the proportion of its members who will be shut out from the comparison, and the greater will be the difference between the true average height, and that yielded by those men who are tall enough to enter the army." When the recruits were separated into indoor and outdoor workers, the outdoor were the taller by 0.8 inch, a difference which, Beddoe surmised, might represent an average difference of more than 2 inches between the populations from which these samples were drawn.

Beddoe surveyed the private returns in geographical order, and confirmed or corrected their indications against those of the other three sources of returns. He found fairly general agreement between sources (1), (2), and (3), but the recruiting returns were often at variance with them. "What may be the average stature of adult Englishmen is a matter of speculation and curiosity, on which one cannot give any but a cautious and guarded opinion. Without doubt it lies somewhere between

5 feet 6 inches and 5 feet 7 inches (1.676 and 1.702 metres). The mean of my private returns (excluding those which consist mainly or wholly of picked men) would occur somewhere about 5 feet 6½ inches (1.693 metres); but the number of those reports whose average greatly exceeds this mean is greater than that of those whose average falls greatly below it. . . . On the whole, my estimate would be 5 feet 6.6 inches or 1.690 metres.

The average for Scotland must certainly be very much higher, perhaps as high as 5 feet 7½ inches; but this can be little better than a mere guess."

Beddoe and others found that stature in general was greater in rural than in urban districts. It is not possible in all of his private returns to separate into urban and rural categories, but since most of his "allies" were country doctors, it would appear that the greater proportion was rural. According to the census of 1871, 62 per cent. of the population of England and Wales was urban and the proportion in Scotland was approximately the same, so that it is likely that the estimates for both countries were biased upwards.

Roberts (1878) was a pioneer of anthropometric technique. In his book he produced, as a guide to measurements, a chart which he hoped would be used generally, and his accumulation of data was secondary to the construction of his chart. He expressed the need for world-wide inquiries to settle "many important and interesting physiological and pathological questions bearing on the growth and development of the body"; he felt that nation-wide surveys would help us to "recognise the nature and peculiar effects of various influences at work in modifying the physical development of our labouring population". There are, in addition, some interesting sets of data in this manual. Among them is a table showing the heights, at different ages, of samples of the "most favoured" class* of the English population, and another similar table for samples of the artisan class from large English towns. The table for the artisan class indicates that maximum stature was attained at 22 or after and was about 66.7 inches. A third table presents data from the two described above with some additional data. It appears less reliable, because the data taken from the first table had been revised, or altered in transcription, and data for recruits include two series that are not strictly comparable. Those taken from Beddoe are used uncritically without regard to Beddoe's conclusions concerning them, and the earlier series (1862-63) refer to two years in which the qualifying

height was 66 inches, an inch more than for Beddoe's recruits.

Nearest in time to these are the results of the British Association Anthropometric Committee survey (1881-1883) and data for the males measured by Galton (1885) in his First Anthropometric Laboratory set up at the International Health Exhibition in South Kensington in 1884. There is little doubt that Galton's measurements would have been most carefully made, but on the other hand it would be extremely difficult to decide what population they represented. The subjects were predominantly from the south of England, interested in the Exhibition, and willing and able to pay for admission. We know no more than that.

The Report by the British Association was based in the main on the data assembled by Beddoe and Roberts. Two analyses were made, one by social class and the other by region, so that it was not possible to decide the extent to which regional differences were attributable to social class differences and vice versa.

On the attainment of full stature the Report says: "The Tables do not show distinctly at what period man attains his full stature, and much difference of opinion exists on this subject. Some French writers (Barnard, Allaire, etc.) maintain that growth in height goes on until the 32nd or 35th year, and Dr. Baxter arrives at the same conclusion from the statistics of the United States Army; while most English writers (Danson, Aitken, Roberts, etc.) regard the 25th as the year of mature growth, and Dr. Beddoe places it as early as the 23rd year, admitting, however, that a slight increase may take place after this age, . . . it is probable that little actual growth takes place after the age of 21, and that it entirely ceases by the 25th year. It is evident, moreover, . . . that the full stature is attained earlier in the well-fed and most favoured class (Class I) than in the ill-fed and least favoured classes of the community (Class IV)." It was found also that stature did not alter with advancing age, and on this the Report may be quoted: "The maintenance of the stature throughout life . . . is a new and unexpected fact, but it is probably due to the survival of the taller and better developed members of the population, and the elimination by disease or death of the smaller and feebler ones. Quetelet has stated that man attains his maximum height at the age of 30 years, and maintains it up to 50 years, after which it begins to recede, and at 90 it has lost three inches. This may be, and probably is, true of individuals if measured from year to year, but it does not appear to be true of the population in the aggregate. The loss of stature resulting from the degeneration and loss of tissue, and the stooping position assumed by old people, is more than counterbalanced by the survival of a

* The "most favoured" class must correspond roughly with Class I of the Registrar-General's (1938) occupational classification as used in his Decennial Supplements on Occupational Mortality. The parallel between other classes in the two series is not so clear.

greater number of individuals who are above the average in height."* It was suggested that much of the confusion arose from the "faulty method of relying on the measurements of many different individuals, instead of measuring the same individuals from year to year until growth ceases".

The word "or" in the phrase "disease or death" may be unintentional but it contains an important truth, for in these older series the sick and the crippled were not measured, but only those who were out and about.

There are several different estimates of adult stature in the British Association Report. One set of estimates (p. 258), made from the whole adult sample without regard to whether the proportions of the subjects in the different social classes in the sample represented the proportions in which they occurred in the population, was: Scots 68.71 inches, Irish 67.90 inches, English 67.36 inches, Welsh 66.66 inches; overall 67.66 inches. A second estimate, from subjects aged from 25 to 55 years, with allowances for the geographical, but not for the social class distribution (Table IV, p. 265), was 67.58 inches for the United Kingdom. The third estimate given (Table XIV, p. 284) takes account of the social class distribution, but not the geographical. This was based on adults from 25 to 30 years of age and was 67.21 inches. Clements and Pickett (1952) assert that Social Class I was over-represented in this sample.

Although the Anthropometric Committee expressed the view that its work was by no means completed, it may be that the publication of the Report gave anthropologists a feeling of achievement. Whatever the reason, there was very little evidence of interest in anthropometric work in the years between 1883 and the sitting of the Inter-Departmental Committee on Physical Deterioration (1904). This body, whose convocation was in great degree due to national concern over the physique of recruits enlisted or rejected during the emergency of the Boer War, presented to the government in 1904 its three-volume report in which it made several statements relevant to this review. As regards the annual returns on recruits it pointed out that "... the class from which the recruits are derived varies from time to time with the conditions of the labour market. When trade is good and employment plentiful it is only from the lowest stratum of the people that the Army receives its supply of men: when, on the other hand, trade is bad, a better class of recruit is available." Confirmation of this view is found in the striking disparity from year to year of the educational qualifications of recruits as disclosed in

the returns, and the phenomenon is reflected to some degree in the changes that occurred in the qualifying stature (see e.g., para. 9717 in Minutes of Evidence). Evidence was given of the extent of diseases affecting growth, rickets, for example, being widely reported. Of this disease one witness stated that in Leeds, as an instance, the incidence among Gentile children in a poor school was as high as 50 per cent. Foremost amongst the recommendations of the Committee was the pressing need for an anthropometric survey, on the grounds "that no sufficient material (statistical or other) was at present available to warrant any definite conclusions on the question of the physique of the people by comparison with data obtained in past times".

This Century

Between the 1904 Report to which we have referred and 1939, surveys were made only on small sections of the adult community. Among them was work by Reid (1912) on medical students at Aberdeen University. He found that male students were not fully grown at about 19½ years. They were measured a second time four years later when they had gained 0.6 inch and then measured 68.3 inches. Of that sample it may be said that it did not represent the "most favoured" class, for the students of that democratic University came from all classes and from rural as well as urban homes in the north of Scotland. Reid, who was himself Professor of Anatomy, was surprised to find that the late increase in height was mostly in trunk length, not in leg length, which suggests that it was not true growth (see above, p. 256).

Several studies of university students were made between those of Venn (1889) and Grant and Hitchens (1953) but, because of the progressive change in representation of the social classes in university populations, we have not examined them in detail. Reid's study was singled out because it was a longitudinal study and therefore important in relation to age of completion of growth in height.

In 1920 the Ministry of National Service published its famous "C3" report with the claim that it was based on a true sample of the manhood of military age, a claim which was not generally accepted. While the controversy still raged, Tocher (1924) published the results of an investigation on Scottish soldiers, measured in 1915 and 1916; in them maximum mean height was about 67.5 inches and was attained between 22 and 23 years of age. There is some question that the men may have been, at least in part, selected by stature so that the regional differences shown, with the Renfrew, Ayr and Lanark group shortest at 66.9 inches, and the north tallest at 68.7, may,

* What Quetelet said (p. 178) was: "On peut considérer la croissance comme entièrement terminée à 30 ans; cependant l'augmentation qu'elle reçoit, après 23 à 25 ans, est déjà à peine sensible."

on the reasoning applied by Beddoe to his recruits, be underestimates of the true regional differences.

In 1935 the Industrial Health Research Board (Cathcart, Hughes and Chalmers, 1935) published its report on "The Physique of Man in Industry". The board used the occupation grouping set out in the 1921 Census of England and Wales and attempted to sample each group adequately over a wide age range, and, except where some industries were geographically highly localised, over as wide an area of the country as possible. A group of undergraduates and one of unemployed males were included also. The report claims success in those aims for all but the group of agricultural workers, which was composed of such small, scattered units that it proved very difficult to sample them. It might with fairness be claimed that the result was a survey of the urban population of the country. The maximum height attained by each of the groups measured was: students 68.9 inches, employed men 67.3 inches, unemployed men 66.5 inches, and the ages of attainment were between 21 and 25. If we apply the proportions in which these groups occurred in the 1931 Census (taking the students to represent Social Class 1) we obtain a weighted mean maximum height for urban Britain of 67.3 inches. Allowing for the advantage in stature possessed by rural over urban subjects, we may consider this an underestimate for the population of the whole country.

Under the Military Training Act of 1939 some 90,000 young men between the ages of 20 and 21, the militiamen called up before the outbreak of war, were medically examined in that year. The results were presented by Martin in 1949. They represent the first set of measurements which can be said to have covered the country as a whole, and the only doubt is whether all the subjects measured had completed their growth, or apparent growth.

From the analysis of these measurements it appears that mean height decreased by small but statistically highly significant degrees from rural to urban to County Borough subjects, a result consistent with earlier work. There was a concomitant higher standard of fitness in country men. The order of heights for different areas of the country was changed from that of the 1880s. The British Association Report placed Scots as tallest, English second and Welsh last; the 1939 data for 20-year-old men placed the English as tallest with an average of 67.5 inches, the Welsh next with 67.1 inches, and the Scots last with 67.0 inches. It was further shown that those who had moved from their birthplace (migrants) were on the average 0.3 inch taller than those who had not. These estimates leave plenty of room for speculation. Were the Scots absolutely and relatively shorter in 1939 because the sample came chiefly from the

lowland industrial belt, or because some of the taller descendants of the 1880 population had migrated to England, or emigrated to be lost to the population altogether?

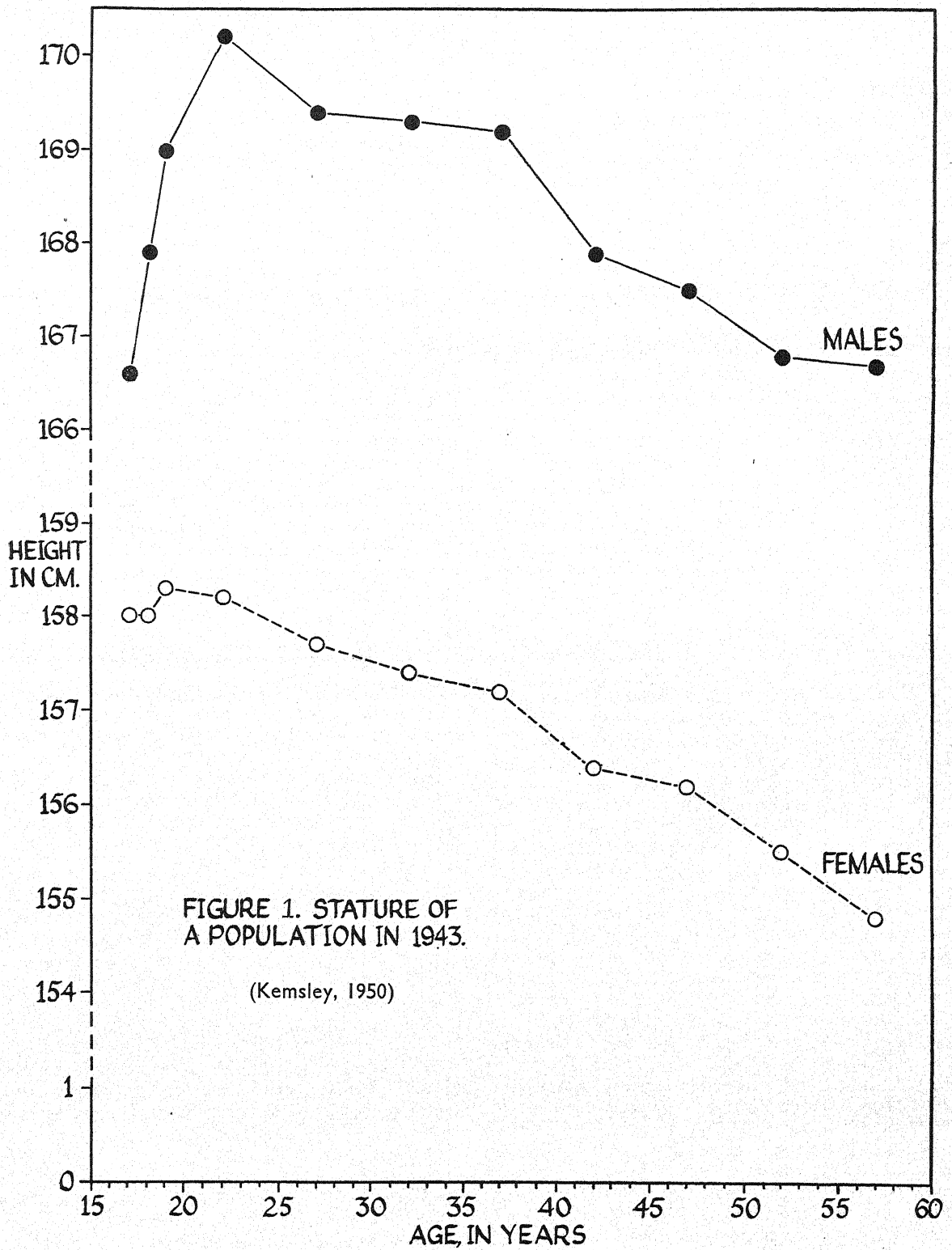
An inquiry was initiated by the Ministry of Food in 1943, primarily to measure bodyweight changes as a continuing check on the adequacy of the national diet. Measurements of stature were included and the results have been reported by Kemsley (1950). The population sampled was the civilian one in 1943, but, as the author pointed out, not all areas were correctly represented. Scotland, for example, was under-represented, and it seems likely from the nature of the survey that most of the Scottish data would have come from the industrial belt between the Clyde and the Forth, in which case the low stature obtained would be in agreement with the earlier findings of Tocher and of Martin.

For this inquiry three groups of males and three groups of females were sampled, employees of large firms and small firms, and miners and housewives. The shapes of the curves relating height to age were so much alike for the groups of one sex (as was pointed out by Kemsley) that they have been combined and the combined unweighted means are given in Figure 1. In the light of these curves, the meaning of Martin's data must be in doubt, since maximum height was not found in the males until between one and two years after the age at which the recruits discussed by Martin were measured.

Kemsley (1950) included in his paper a curve of stature against age based on over 200,000 males measured from 1885 to 1900 in an American medico-actuarial mortality investigation, and published in 1912. This series agreed with the early British series in showing no reduction of mean stature with age and strengthens the view that a true difference exists between the series of last century and this. It is greatly to be regretted that in the continuation of this work (Kemsley, 1953) weight alone was measured when the same 344 subjects were seen at intervals between 1943 and 1950.

During the years 1939 to 1946 some 70 per cent. of the male population of military age were examined by the medical boards of the Ministry of Labour and National Service. Clements and Pickett (1952) report on the findings for stature from a preliminary study of the 1941 records for Scotland.

It is evident from the method of sampling and the age distribution of the sample that it is not representative of the male population of Scotland at ages 17 to 42. The conclusions relevant to this inquiry are that maximum stature appeared to be reached by the 19th year and was 67 inches, and that stature decreased with increasing age.



Of their study the authors say "It may, therefore, be taken that the data abstracted from the records refer to a random sample within occupations and age groups, but that the numbers in the groups are not in proportion to their occurrence in civilian life". Since some occupations were better represented than others, and since differences in stature have frequently been shown to exist between occupations, the national average of 67 inches arrived at should be treated with some reserve. This estimate of Clements and Pickett does agree with Martin's for Scots aged 20 but Kemsley's analysis would suggest that maximum stature had not been attained before 22 years in the sample on which he reported.

In summary, the major surveys on record and available to us for scrutiny are as follows.

Beddoe made a nation-wide survey with the help of physicians, mostly rural. In making his estimates he does not appear to have allowed for the rural bias. His private returns, on which the estimates were based, totalled about 5500 for England, 1250 for Scotland and 100 for Ireland. He estimated 66.6 inches to be the maximum height for England and hazarded a guess for Scotland of 67.5 inches. On this basis, an estimate for the whole country might be 66.7 inches. The age of attainment of maximum height was assumed to be 23.

Roberts had measurements for a total of 28,228 men over 18 years of age of whom 24,225 were recruits, in part returns for the years 1862-3 when the qualifying height was 66 inches and in part for the recruits, already discussed by Beddoe, for the years 1864-5 when the qualifying height was 65 inches. The remainder, 4000 men, were either of the most-favoured class or artisans.

The British Association Anthropometric Committee added little to that total. They were of the opinion that there was no increase in height after age 25. Of Galton's sample of 6987 men we have no description.

On the basis of the evidence presented to it, the Royal Commission on Physical Deterioration was extremely critical of recruits as a sample of the community and decided it had no data with which to make secular comparisons of physique.

In this century Reid assembled measurements of nearly 800 Scottish university students and found that height increased after age 20. Tocher measured 2687 Scottish soldiers. His age of maximum height was between 22 and 23 years.

Cathcart measured 13,656 men, most of them urban. The estimated mean maximum height for the general population, 67.3 inches, is probably an underestimate for the years 1929-32. His ages at the maximum were between 21 and 25 years.

Martin had measurements of 90,000 men aged 20. This sample covered the whole country, the

first to do so since Beddoe's survey. The mean was 67.4 inches. It may be an underestimate if age 20 is below the age of attainment of maximum height.

Clements and Pickett's sample of 3692 Scotsmen gave a maximum of 67 inches at 19 years in 1941. Kemsley's sample of 26,703 in 1943 was of the civilian war-time population, almost entirely industrial, and regions were not correctly represented. His maximum of 67.2 or 67.3 inches at age 22 would almost certainly underestimate the height of the normal population.

The sequence of roughly comparable estimates of maximum height, in inches, with dates of measurement, is this: Beddoe (1870) 66.7, Cathcart (1929-32) 67.3, Martin (1939) 67.4 and Kemsley (1943) 67.2 or 67.3.

In view of the fact that Beddoe made no allowance for the excess of rural measurements and none for the sick and crippled not out and about to be measured, it may be taken that he overestimated mean maximum height. Since all the more recent analyses probably produced underestimates, the difference would appear to be in favour of the recent young adult population.

The sequence of estimates of age at which maximum height is attained suggests a gradual forward movement from age 30, or even later, to ages between 19 and 23.

INTERPRETATION OF THE RECORDS

Morant (1950) boldly attempted to co-ordinate the information from all the British published sources he could find, in order to discover what secular change, if any, had taken place in what he called the maximum mean height of the population. In addition he had some data for Army and Air Force personnel, during and subsequent to the 1939-45 war, which we have not been able to procure.

Maximum and Post-maximum Heights

All these Army and Air Force groups had maximum mean heights in excess of 67.7 inches, which they attained between 19 and just over 21 years of age. Morant's collected series totalled "more than two million men". Of these over 1,700,000 were army recruits between 1860 and 1913; 216,000 were conscripts medically examined in 1917-18 in the west midlands of England, and these were used to illustrate height "increasing to a maximum about age 25 and then declining with advancing age. This form is shown by all the longest series." (But there was no decline before age 50 in the British Association assembly of 1883 or in Tocher's Scottish soldiers before 37, the oldest measured, in 1915.) There were in addition the 90,000 males aged 20 measured in 1939 (Martin's

series). Two million of the total are thus accounted for. The nature of the residue is not completely specified numerically or in kind.

Of the army recruits enough has been said already to illustrate how difficult it is to define the population of which they are a sample in any particular year. Of the 1917-18 west midland series Morant says that in all age groups after 18 years many of the men had previously been examined for military service and rejected; and it is by no means certain that, even as recently as 1939, the militiamen at 20 years had attained their full stature. Morant describes two methods for estimating the age of attainment of maximum mean height within a group, and there is no doubt that the two earlier series of recruits would be satisfactory for comparing these, but there is no means of estimating with any precision what class or classes of the population are represented. The militiamen (1939) certainly give a clear picture of regional differences, indeed, the first adequate regional picture since Beddoe; but the question of attainment of maximum height goes unanswered. Between the earlier surveys and the most recent, a considerable amount of migration had taken place, migration which latterly, according to Martin, was selective as regards stature. There was also a great increase of urbanisation. Such changes must make the standardisation of surveys for regional differences, which Morant attempted, very largely a speculative process.

Effect of Selective Mortality over a Century

We have shown that the historical sequence of estimates of age at maximum height suggests a forward movement from age 30 or over to ages between 19 and 23. Morant takes a shift as established and bases his conclusions on the assumptions that age at maximum height was 26 a century ago and is $21\frac{1}{2}$ now. But the data are no more adequate to fix either point or to measure the change for the general population than they are to estimate mean height itself.

Morant further concludes that the secular change in time to attain maximum height has been greater in the lower classes of the population. Even in that respect, the picture is not uncomplicated. Here we may consider the complications in more detail. Two distinct concepts exist, as described in the introduction to this review, and they do not everywhere appear to have been clearly separated. The one is of the mean maximum stature of a population, the other of the maximum stature of an individual. In the population as a whole, high mean stature and high mean expectation of life are characteristic of the higher social classes. This fact could provide an explanation, as indeed was suggested by the British

Association (see p. 258), for the constancy of height with increasing age in the British Association 1883 series and possibly in Tocher's 1924 records as due to the earlier death, on the average, of the shorter individuals, so that the older groups of the population are progressively more selected by stature, and this might outweigh any shrinkage that might occur in the surviving individuals. Not only so, but if, at any period in history, this weeding-out began to operate in early adult years it would have the effect of raising the mean maximum stature after individual increase in height had ceased, though of course it could not affect the maximum stature of the individuals.

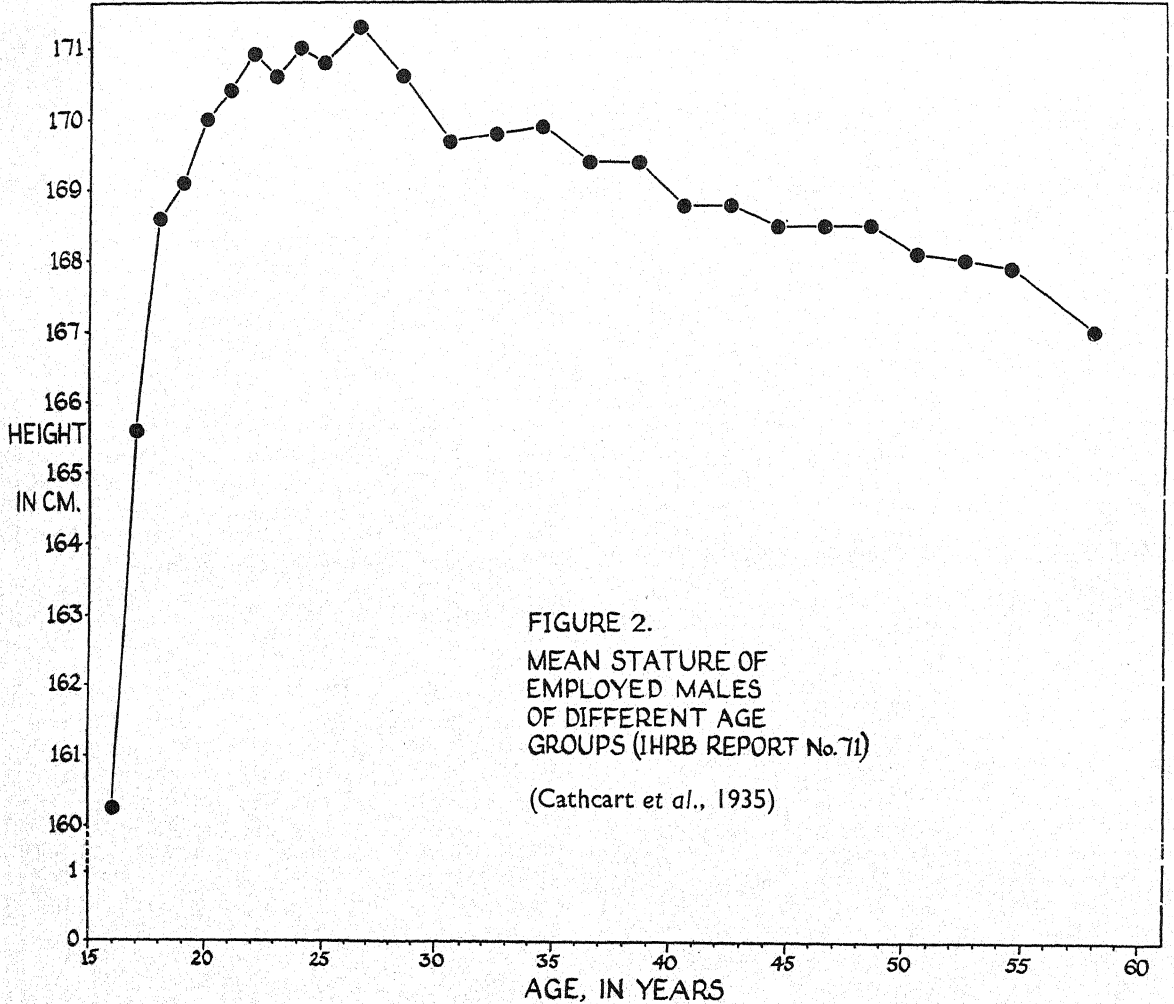
Effect of Initiation of Welfare Services

In later series of measurements, taken when social conditions had improved, a decline with age of the mean height is obvious, but the rate of decline is not uniform. In the records analysed by Kemsley (1950) for men measured in 1943 a decided dip occurs in the curve (Figure 1) about age 40. The curve of the means for women is shown with that for the men to illustrate that the dip is not peculiar to men and is not in consequence likely to be entirely due to the removal by the 1914-18 war of the fitter and taller who by 1943 would be in the older age groups. Clements and Pickett's (1952) data for men measured in 1941 in Scotland by local medical boards of the Ministry of Labour and National Service give evidence of a similar change in rate of decline. Regression coefficients of stature on age are shown for separate social classes as defined by the Registrar General (New classification; General Register Office, 1951) for age groups 17-19, 20-29 and 30-39, with a regression coefficient for the whole of - 0.032 inch per year. It is important to note that, in all but Class 1 and 2 combined, the regression is steeper for the 30-39 than for the 20-29 group. The steeper slopes in the later period are in keeping with a fall in height between those aged 31 and those aged 40 years. In the industrial workers, and others, measured by Cathcart, Hughes and Chalmers (1935) between 1929 and 1932 the steepening of the fall in height occurs about age 27. In Figure 2 the mean heights of employed men are shown for different age groups, only those groups with more than 200 men being used. A similar change in slope of the curve appeared among the unemployed and students, but the numbers in these groups were smaller so that the means were somewhat less reliable. All of these records (which were made independently at three different dates), show a "sudden" fall, or, to look at it the other way round, a "sudden" rise in mean height, in age groups born between 1900 and 1910. Although some of the effect may be

attributed to selective removal of the tall in the 1914-1918 war, the similar behaviour of the curve for women (Fig. 1) indicates that this was not the only cause.

A possible contributory cause may be found in the wealth of legislation affecting the welfare of mother and child which was enacted and brought into force in the years following the turn of the century. For a brief account see MacNalty (1950)

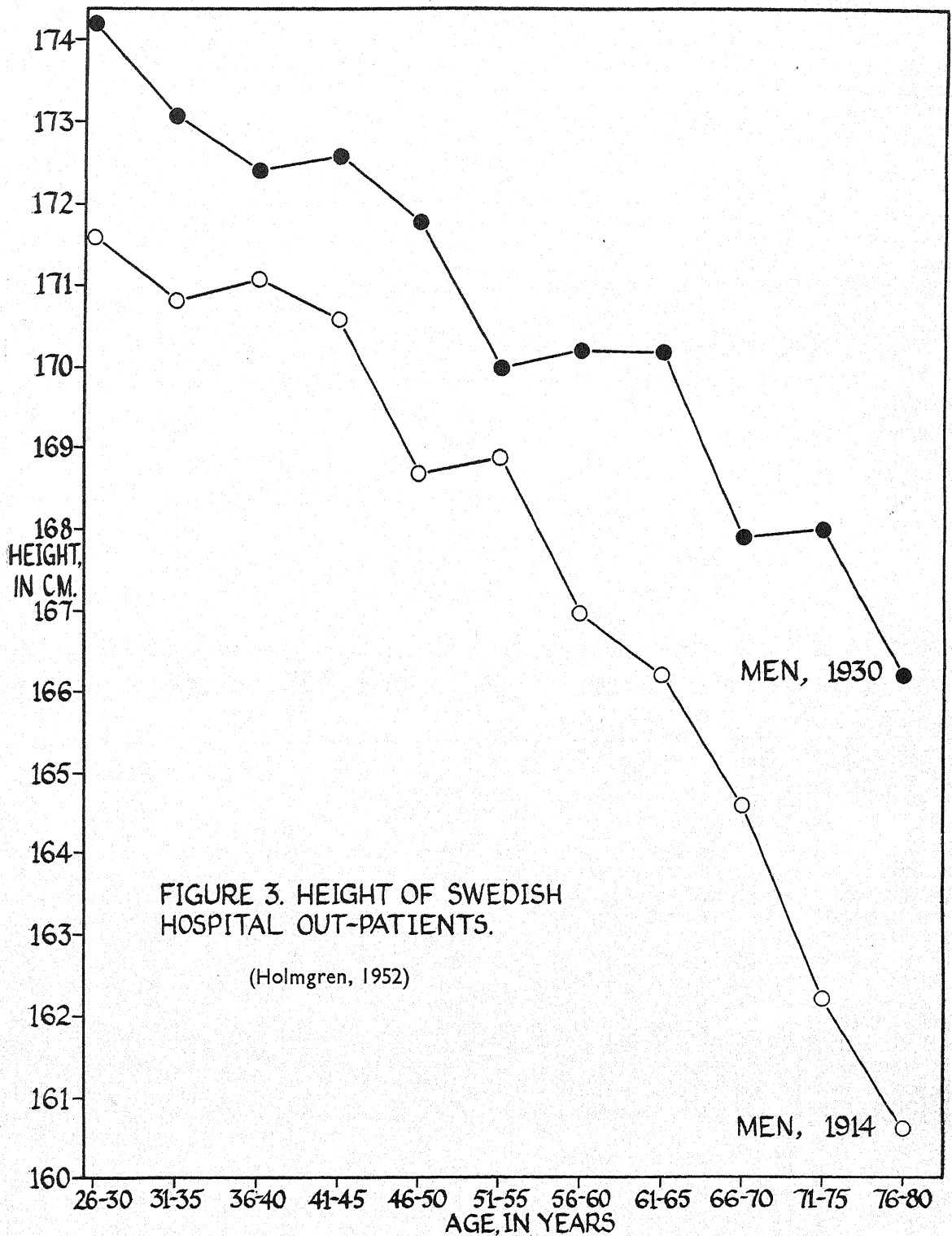
the heights and weights of London schoolchildren says "that children of today are not merely heavier or merely taller than their parents were, but are members of a generation altogether of greater physique". The social gradient would explain the absence of decline of height with age in Social Classes 1 and 2 of the 1941 Scotsmen, since these classes had little need, if any, of benefits from public health legislation.



and for greater detail Frazer (1950). The new developments included the establishment of welfare centres, the feeding of underfed children and the school medical service; improvements of sanitation and housing; and unemployment insurance. They did result in reduction of deformity and crippling and in progressively better growth among children, and there is still no evidence to show that better growth is not associated with higher maximum stature for the individual. Sir Allen Daley (1950) in his Report on

It is not a far step in reasoning to the suggestion that, of the populations sampled for the curves, the older parts (that is, those below the "dip") came from age groups which did not as young adults reach the mean maximum stature attained by the younger groups.

Morant's interpretation of the data differs from ours in the following respects. He claims that with advance in age a decline in height occurs in and may be "supposed the same" for all British series. But Quetelet, Beddoe and Roberts, and



the British Association Anthropometric Committee also, found no decline before age 50 and Tocher too found none before 37, the oldest group he examined. We have shown that all the subsequent series mentioned above show a decline and a change in rate of decline which coincides, regardless of the date of the survey, with birth in the first decennium of this century.

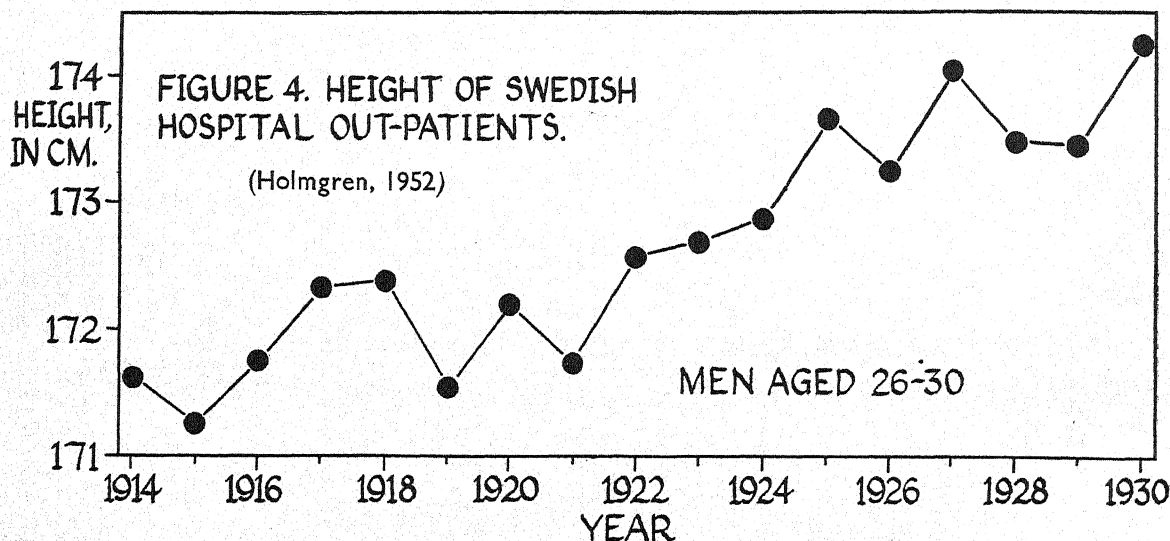
Morant next explicitly takes the curve relating the mean observed height to the age of the population as if it were the curve of an individual. "The decline following the attainment of skeletal maturity can be attributed to a normal shrinkage of the length of the body with advancing age". He is not entitled to do so on physiological or historical grounds. He sets up, only to knock

EVIDENCE OF SECULAR CHANGE FROM SCANDINAVIA

Support is given to our interpretation by two sets of Scandinavian records.

Swedish Hospital Outpatients

Holmgren (1952) reports measurements of over 46,000 outpatients at a Swedish hospital, taken between 1914 and 1930. The curve of stature against age for each of the years showed that in any one year stature decreased in the older groups, and that for all age groups (the data were grouped at 5-year intervals) stature was greater in 1930 than in 1914. The data for men are shown in



down, a hypothesis that the decline might be due to selective death rate, "taller men being supposed more prone to die at younger ages", which hypothesis, whether it was ever set up before or not, is certainly not supported by studies of social class or occupational mortality.

He sums up his interpretation in these words: "As the prime is reached to-day at a younger age than formerly the decline in adult life also starts earlier, and this implies that for ages after the early twenties people to-day are slightly less tall, on the average, than their recent ancestors were." We suggest that the change which has taken place in selective mortality and expectation of life with the development of welfare services has increased the proportion of the poorer social classes present in older age groups and so has reduced the mean heights of these groups. It is possible that the mean height of young adult groups has been reduced in the same way.

Figure 3 which compares the 1914 and 1930 series and Figure 4 which shows the unmistakable upward trend in the 26 to 30 year old group. By a series of comparisons at 10-year intervals of the heights of people born within some given interval, Holmgren deduced that individual stature was in fact increasing by 3 cm. between the ages of 26 and 70 years. Alternatively and, we believe, more reasonably, the survivors of every group would be more highly selected for height at each successive interval, because of the tendency for the taller to have a greater expectation of life. This is the effect of selective mortality, not on groups born at different times, but on a group born within one time interval, whose survivors are sampled at successive intervals. The picture is not analogous to that given by an instantaneous sample of all ages.

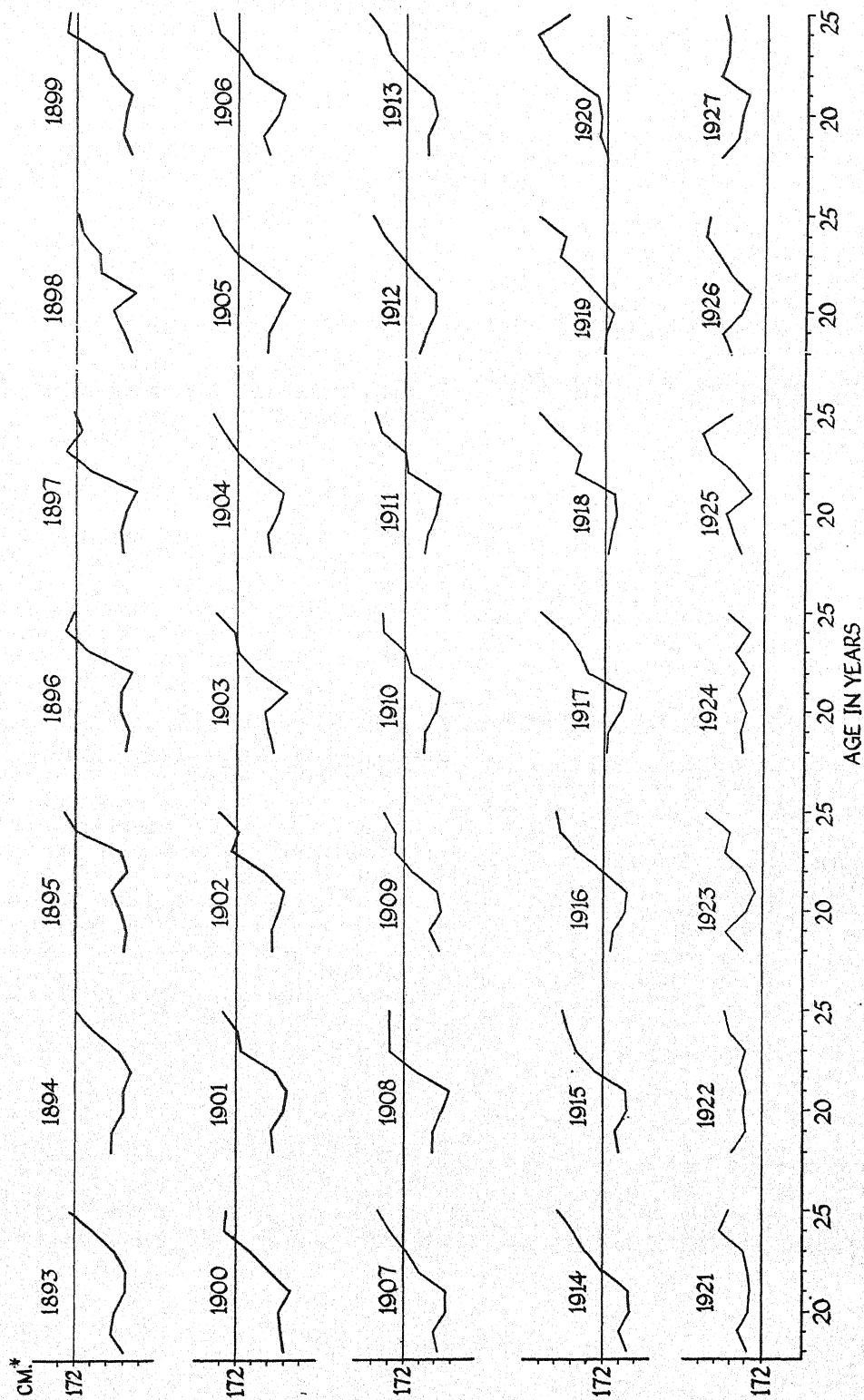


FIGURE 5. HEIGHT OF DANISH MALES AT AGES 18 TO 25, FOR DIFFERENT YEARS OF BIRTH FROM 1893 TO 1927.

*The Height scale is marked in units of 1 cm. with an arbitrary base line at 172 cm.

Danish Service Men

The final set of figures is for Danish service men, and was procured by courtesy of Dr. Hans F. Helweg-Larsen, Director of the Institute of Human Genetics in Copenhagen. They represent the results of medical examination of men for the Danish forces from 1911 to 1952. Military service is universal. All those called up are measured whether they are found fit for service or not, and all measurements are included. The total measured annually is between 33,000 and 40,000. The data are presented in Figure 5 and are self-explanatory. There is a tendency for the 18- and 19-year-old to be taller than the 20-year-old. Dr. Helweg-Larsen suggests that the younger groups contain many volunteers who present themselves before they are required to do so and are somewhat taller than the average of their age groups. The main body of men (20-year-old) numbers over 20,000 in each year and any of them who do not meet the requirements, *e.g.*, of stature, will be measured again in three subsequent years, after which, if they are still "substandard", they are no longer called to appear. Thus there is some duplication of measurement, but the 20-year-old represents a very good cross-section of the population, apart from those in university training, mostly of the higher social classes, who are deferred for up to five years. This deferred group makes its appearance from 23 to 25 years of age, and accounts for the rise in the second half of each curve in the figure. At each curve, a line is drawn representing 172 cm. (67.7 inches) and the figure clearly shows how the height of the young adult has increased over the years. In the early groups even the older and upper class student groups barely reached 172 cm. at an age when they must have been fully grown. All groups improve steadily until in the later ones all are above 173 cm. (68.1 inches). This gives clear evidence of improving stature in a population similar to our own.

SUMMARY AND CONCLUSIONS

To summarise briefly, it seems clear that in Britain our information is inadequate to show directly by comparing different series of records whether the mean maximum stature of the population has increased over the last 100 years or not.

Changing mortality rates and migration, with inadequate definition of the populations sampled, combine to obscure the picture. Of the recent data Martin's, which are the best in respect of geographical distribution, are not adequate to define either the mean maximum height of the male population, or the mean age at which it is attained. Of what happens in the individual after the maximum has been reached we know little or nothing. For women we have, at the moment, next to no information. Some may be forthcoming from Services records but there will be little of a representative kind with which to compare it.

It appears that the age at which mean maximum height is attained has moved forward but neither the details of the age-shift nor the heights attained can be assessed with any accuracy. On the assumption that a decline sets in as soon as maximum height has been attained in the individual, Morant argues that, because the mean maximum height of the population has apparently not changed, but is attained earlier, the population of above 23 years of age is not now at any age as tall as it was in the last century. The initial assumption is not supported by evidence and the more recently recorded decline of height with age is explicable on the altogether different grounds that the short now live longer. The view that mean maximum height may have risen with improved social conditions is supported by data from Sweden and Denmark whose populations resemble our own in social history.

The oft-repeated plea for an anthropometric survey of the nation has gone unattended now for nearly a hundred years. Not only one survey but a routine of surveys is still needed if we wish to know what changes are taking place in the physique of the nation. These should supplement and extend in both directions the measurements of schoolchildren; they should include repeated studies of representative samples into old age to establish the unknown pattern of change in physique of the ageing adult.

Our acknowledgements are due to *Acta medica scandinavica* for permission to reproduce Figures 3 and 4 from Professor Holmgren's paper, to Mrs. Laura Alstrup for referring our inquiry about Danish recruits to Dr. Helweg-Larsen, and to Dr. Helweg-Larsen for the transcripts of records.

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1. TECHNIQUE

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SCANDRETT, F. J. **A modified all-glass apparatus for the determination of nitrogen by the micro-Kjeldahl method.** *Analyst*, 1953, **78**, 734-737. [Dept. Clin. Chem., Univ. Edinburgh.]

1430

DELAUNOIS, A. L. **A modified manometric Van Slyke apparatus.** *Arch. internat. Pharmacodyn.*, 1953, **94**, 426-429. [J. F. Heymans Inst. Pharmacol., Univ. Ghent.] French summary.

The taps in the Van Slyke apparatus are replaced by new vacuum-tight taps of special construction, based on the principle that if a leak should occur in the ground part of the stopcock the atmospheric pressure would push in a semi-liquid grease from a cup and seal the leak. The glass "cross connection" between the estimation chamber, the manometer and the stopcocks is replaced by a stainless steel tube connected at either end with the glass parts by heavy rubber vacuum tubing.—W. Godden.

1431

POKROVSKIĬ, A. A. **Nasadka i kyubety dlya kolichestvennoi spektroskopii. [Cuvettes and cuvette holder for quantitative spectroscopy.]** *Biokhimiya*, 1953, **18**, 201-204. [Tsentral. Nauch.-Issled. Ispyt. Inst. Voenn. Med., Moscow.]

1432

MIETTINEN, J. K. and MOISIO, T. **A self-recording strip photometer for paper electrophoresis and paper chromatography.** *Acta chem. scand.*, 1953, **7**, 1225-1238. [Biochem. Inst., Helsinki.]

The construction and use of the instrument are described; a filter photometer is combined with a self-recording galvanometer from a polarograph. H. G. Bray.

1433

KEPES, A. **Séparation de mélanges biologiques à l'aide d'un nouvel appareil de répartition à contre-courant. [Separation of biological mixtures by a new counter-current distribution apparatus.]** *Bull. Soc. Chim. biol.*, 1953, **35**, 1243-1253. [Inst. Pasteur, Paris.]

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The construction and working of a new apparatus is described. It has the following advantages; the number of elements can be varied at will; it functions continuously without shaking but by injection of the mobile phase by compressed air; it works equally well with the light or the heavy solvent as the mobile phase; it is rapid and automatic in its action and can work in air or in an inert gas. Its use in the separation of amino-acids is indicated, and it is shown to require less time and less solvent and to be more exact than chromatographic methods.—W. Godden.

1434

SHIPE, W. F., DAHLBERG, A. C. and HERRINGTON, B. L. **A semi-automatic cryoscope for determining the freezing point of milk.** *J. Dairy Sci.*, 1953, **36**, 916-923. [Dept. Dairy Indust., Cornell Univ., Ithaca, N.Y.]

1435

PERSIDSKY, M. D. **A vibratory microtome for sectioning living tissue.** *J. Lab. Clin. Med.*, 1953, **42**, 468-471. [Dept. Botany, Univ. Wisconsin, Madison.]

The microtome, which is described and illustrated, has been evolved from other models. The knife vibrates at a frequency of 100 to 300 cuts per sec. with an amplitude of 0.8 to 0.1 mm. The instrument is capable of cutting sections as thin as 3 μ . and of a smoothness and general quality approaching those obtained from embedded or frozen material.—W. Godden.

ANALYTICAL METHODS

General

1436

RYABCHIKOV, D. I. and SENYAVIN, M. M. **[Chromatographic analysis.]** *Zh. Anal. Khim.*, 1953, **8**, 195.

1437

OL'SHANOVA, K. M. and CHMUTOV, K. V. **[The chromatographic method in qualitative analysis. 1.]** *Zh. Anal. Khim.*, 1953, **8**, 211.

1438

SAIFER, A. and ORESKES, I. **Circular paper chromatography. Studies of physical factors that may influence R_f values.** *Anal. Chem.*, 1953, **25**, 1539-1544. [Div. Labs., Dept. Biochem., Jewish Sanit., Brooklyn 3, N.Y.]

The chief factors studied were pH, quality of paper, temperature and length of "wick".

H. G. Bray.

Carbohydrate Constituents

1439

WILLIAMS, K. T. and BEVENUE, A. **Qualitative paper chromatography of sugars in plants. Technique and reagents.** *J. Assoc. Off. Agric. Chem.*, 1953, **36**, 969-979. [W. Reg. Res. Lab., Albany, Calif.]

This is for the most part a more detailed account of work already published (Abst. 1277, 4655, Vol. 21; 28, Vol. 22; 1436, Vol. 23).—W. Godden.

1440

GROSS, D. **Paper electrophoresis of sugars at high potential gradients.** *Nature*, 1953, **172**, 908-909. [Res. Lab., Tate and Lyle, Ltd., Ravensbourne, Westerham Rd., Keston, Kent.]

Potential gradients of 40 to 60 volts per cm. can be applied for 1 to 3 hr. if the paper strip is cooled by placing it between glass sheets or polythene or telcothene films which are themselves between copper plates cooled with tap water. Examples are given of the separation of sucrose, raffinose, stachyose, melibiose, glucose and fructose.

H. G. Bray.

1441

LAUNER, H. F. and TOMIMATSU, Y. **Rapid accurate determination of carbohydrates and other substances with the dichromate heat-of-dilution method.** *Anal. Chem.*, 1953, **25**, 1767-1769. [W. Reg. Res. Lab., Albany, Calif.]

Organic substances in which each carbon atom is attached to oxygen, e.g., sugars, starches, certain acids and alcohols, and aromatic substances can be estimated by the procedure described, assuming complete oxidation to carbon dioxide, even in the presence of non-oxidisable substances and in binary mixtures. The sample is treated with an aqueous solution of $K_2Cr_2O_7$ and concentrated H_2SO_4 . After reaction (about 10 min.) the excess dichromate is estimated electrometrically in the diluted reaction mixture.—H. G. Bray.

1442

LAUNER, H. F. and TOMIMATSU, Y. **Rapid accurate determination of cellulose with the dichromate heat-of-dilution method.** *Anal. Chem.*, 1953, **25**, 1769-1770. [W. Reg. Res. Lab., Albany, Calif.]

Cellulose can be estimated satisfactorily by the above procedure (cf. preceding Abst.) if a correction factor is applied.—H. G. Bray.

1443

JOHANSON, R. **New specific reagent for keto-sugars.** *Nature*, 1953, **172**, 956-957. [Div. Plant Indust., C.S.I.R.O., Canberra.]

1444

YAGER, I. **Rapid determination of blood acetone and blood glucose.** *J. Lab. Clin. Med.*, 1953, **42**, 474-478. [Dept. Med., Sch. Med., Tulane Univ., New Orleans, La.]

1445

FOWWEATHER, F. S. **The detection of galactose in urine.** *Biochem. J.*, 1953, **55**, 718-720. [Dept. Chem. Pathol., Univ. Leeds.]

1446

HADORN, H. and JUNGKUNZ, R. **Zur Untersuchung von Traubenzucker-Tabletten. [Analysis of glucose tablets.]** *Mitt. Geb. Lebensmittel. Hyg.*, 1953, **44**, 364-370. [Lab. VSK, Basle.] French and English summaries.

1447

MATHERS, A. P. and BECK, J. E. **Determination of yeast-fermentable sugar in beer.** *J. Assoc. Off. Agric. Chem.*, 1953, **36**, 954-957. [Bur. Int. Revenue, Washington, D.C.]

1448

DISCHE, Z. **Qualitative and quantitative colorimetric determination of heptoses.** *J. Biol. Chem.*, 1953, **204**, 983-997. [Dept. Biochem., Coll. Phys. Surg., Columbia Univ., New York.]

1449

GATES, R. L. and SANDSTEDT, R. M. **A method of determining enzymatic digestion of raw starch.** *Cereal Chem.*, 1953, **30**, 413-419. [Nebraska Agric. Exp. Stat.]

See also Abst. 2201.

Nitrogenous Constituents

1450

BAKER, P. R. W. **The decomposition of ammonia in sealed-tube micro-kjeldahl digestions with a selenium catalyst.** *Analyst*, 1953, **78**, 500-501. [Chem. Div., Wellcome Res. Labs., Beckenham, Kent.]

Under the conditions described, appreciable decomposition of ammonia may result from the use of temperatures above about 360° C. and long digestion times.—H. G. Bray.

1451

YUEN, S. H. and POLLARD, A. G. **Determination of nitrogen in soil and plant materials: use of**

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boric acid in the micro-Kjeldahl method. *J. Sci. Food Agric.*, 1953, **4**, 490-496. [Agric. Chem. Dept., Imperial Coll. Sci. Technol., London, S.W.7.]

It is recommended that a 1.0 per cent. solution of AnalaR boric acid should be used to trap the ammonia distilled off. Of the indicators tested the methylene blue methyl red indicator was found to be the most satisfactory. The results are affected by the purity of the grade of boric acid used and the concentration of the solution. A volume of 10 ml. of 1.0 per cent. boric acid solution will fix 5 mg. N during the micro-distillation. A modified Markham micro-Kjeldahl apparatus is illustrated and described.—W. Godden.

1452

HERBAIN, M. Sur l'adaptation microanalytique de la réaction de Nessler. Application aux milieux biologiques. [Micro-analytical adaptation of the Nessler reaction. Application to biological media.] 1. Le dosage de 25 à 100 γ d'azote. [1. Estimation of 25 to 100 μ g. nitrogen.] 2. Le dosage de 5 à 10 γ d'azote. [2. Estimation of 5 to 10 μ g. nitrogen.] *Bull. Soc. Chim. biol.*, 1953, **35**, 1031-1039; 1233-1241. [Serv. Sci. Roussel-Uclaf.]

1. Full details of apparatus, reagents and procedure are given.

2. The method described above for 25 μ g. N has been modified for the smaller quantities. An apparatus for destruction of organic matter by digestion with H_2SO_4 and subsequent distillation of NH_3 and its collection in acetic acid is illustrated and described. Over the range of 5 to 10 μ g. the results have an accuracy of ± 5 per cent.

W. Godden.

1453

VARNER, J. E., BULEN, W. A., VANECKO, S. and BURRELL, R. C. Determination of ammonium, amide, nitrite, and nitrate nitrogen in plant extracts. *Anal. Chem.*, 1953, **25**, 1528-1529. [Dept. Agric. Biochem., Ohio State Univ., Columbus 10.]

The procedure described permits the estimation of ammonium, amide, nitrite and nitrate N in a single sample of extract. Ammonium N is distilled from the sample buffered to pH 10; the residue is then treated with strong alkali and amide N is distilled off in steam. Treatment of the residue from this operation with 20 per cent. $FeSO_4$ reduces nitrite N to ammonia, which is then removed, and finally the addition of a saturated solution of Ag_2SO_4 catalyses the reduction, by the $FeSO_4$ present, of nitrate N to ammonia, which is removed and estimated.—H. G. Bray.

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1454

KALMIKOV, P. E. Opređenje belka v pishche. [The estimation of protein in food.] *Gigiena Sanit.*, 1953, No. 4, 34-40. [Voen.-Med. Akad. Im. S.M. Kirov.]

From 3 to 5 g. food is ground up, moistened with 5 ml. concentrated H_2SO_4 (sp. gr. 1.84) and ground again until smooth. One ml. H_2O_2 is added and the mixture is heated with stirring for 20 to 30 min. on a water-bath, after which it is quantitatively transferred to a 250-ml. flask and made up to standard volume. The final liquid should be homogeneous. One ml. of homogenate is heated with 1 ml. concentrated H_2SO_4 and 3 to 4 drops of H_2O_2 till a colourless solution is obtained. The solution is diluted to 35 to 40 ml. with distilled water and almost neutralised with NaOH (the amount being ascertained beforehand). The pH is adjusted to 5.5 to 6, after which the solution is made up to standard volume. The ammonia N is estimated colorimetrically with Nessler's reagent, the colour being compared with standard colours. Results obtained by this method and the normal Kjeldahl method indicate that the error of the colorimetric method is greater than that by the Kjeldahl method, being about 7 per cent., but this is within the limits of error of visual colorimetry. The application of photocolorimeters will probably cut this error down to 1 to 2 per cent. The main advantage of the method is that it is time-saving.

W. Hughes.

1455

WALDMAN, R. K., KRAUSE, L. A. and BORMAN, E. K. Determination of total protein in small quantities of spinal fluids: confirmation of the accuracy of a colorimetric method using Folin-Ciocalteu reagent in the presence of copper. *J. Lab. Clin. Med.*, 1953, **42**, 489-492. [Bur. Labs., Connecticut State Dept. Health, Hartford.]

The method of Daughaday *et al.* (Abst. 36, Vol. 23) is applicable to 0.2 ml. serum or plasma and is relatively little affected by the albumin:globulin ratio and so is preferable to turbidimetric methods.

H. G. Bray.

1456

KOZLOVSKY, V. S. Prostoi metod opredeleniya kolichestva obshchego belka i belkovykh fraktsii v syvorotke krovi. [Simple method of estimating total protein and protein fractions in blood serum.] *Sovet. Med.*, 1953, **17**, No. 3, 42-43. [Klin. Lab., Donets. Inst. Fiziol. Trud.]

Total protein is estimated by Shul'tsev's method (*Sovet. Med.*, 1947, No. 3; 1949, No. 6). This is based on the appearance of a white ring at the boundary between a layer of HNO_3 and the diluted blood serum when the latter is carefully poured on

to the HNO_3 . Under these conditions, if the ring appears in between 2 and 3 min. the protein content is 0.03 per cent. The applications of this method to the estimation of fibrinogen in plasma, and of albumins is described; the dilution of the serum is adjusted so as to give a white ring within a specified time.—W. Hughes.

1457

BÖHLE, E. and FISCHER, H. Eine colorimetrische Routinemethode zur Bestimmung kleiner Eiweissmengen in Körperflüssigkeiten und Geweben. [A colorimetric routine method of estimating small amounts of protein in body fluids and tissues.] *Klin. Wochenschr.*, 1953, **31**, 798–802. [1. Med. Klin., Univ. Frankfurt a.M.]

1458

SAIFER, A. and NARBY, T. The photometric microdetermination of gamma globulin in cerebrospinal fluid by a quantitative protein flocculation-ninhydrin reaction. *J. Lab. Clin. Med.*, 1953, **42**, 316–325. [Div. Labs., Dept. Biochem., Jewish Sanit., Brooklyn, N.Y.]

1459

SCHILLING, K. Serum protein fractionation by means of ammonium sulphate in the presence of phenolic compounds. *Acta chem. scand.*, 1953, **7**, 1007–1009. [Biol. Inst., Carlsberg Found., Copenhagen.]

Mainly undenatured albumin and α -globulin are precipitated from horse serum by ammonium sulphate (up to a final concentration of 20 per cent. saturation) in the presence of phenol or cresol.—H. G. Bray.

1460

GABRIO, B. W., SHODEN, A. and FINCH, C. A. A quantitative fractionation of tissue ferritin and hemosiderin. *J. Biol. Chem.*, 1953, **204**, 815–821. [Dept. Med., Sch. Med., Univ. Washington, Seattle.]

1461

LARSON, D. L. and RANNEY, H. M. Filter paper electrophoresis of human hemoglobin. *J. Clin. Invest.*, 1953, **32**, 1070–1076. [Dept. Med., Coll. Phys. Surg., Columbia Univ., New York.]

Procedures are described for the qualitative and quantitative analysis of human haemoglobin. The effects of time of run, potential difference, buffer pH, conversion to carboxyhaemoglobin, size of paper and other variables are discussed.

H. G. Bray.

1462

BERKEŠ, I. and KARAS, V. Fibrinogenbestimmung mittels der Papierelektrophorese. [Estimation of fibrinogen by electrophoresis on paper.] *Biochem. Ztschr.*, 1953, **324**, 499–501. [Inst. Angew. Med. Chem., Univ. Zagreb.]

Fibrinogen moves with the ϕ -component of plasma during paper electrophoresis in phosphate buffer.—H. G. Bray.

1463

FREIMUTH, U. Studien über die Eiweisskörper des Milchserums. 1. Fraktionierung durch Aussalzen und Elektrophorese. [The proteins of whey. 1. Fractionation by salting-out and electrophoresis.] *Biochem. Ztschr.*, 1953, **324**, 476–484. [Inst. Tierzuchtforsch., Deutsch. Akad. Landwirtschaft., Berlin.]

The solubility curve of whey having indicated the presence of 2 protein bodies, these were salted out by Na sulphate and separated into an albumin and a globulin fraction. Electrophoresis of the whey and of the salted-out preparations permitted the differentiation of 2 protein bodies in the albumin fraction, and at least 3 in the globulin fraction with different migration rates. For precipitation of the proteins separated by salting out, the usual protein precipitants, tungstic acid, Almén's reagent, and 10 per cent. trichloroacetic acid, proved about equally effective. At boiling temperature 4 per cent. trichloroacetic acid was also satisfactory, but at room temperature about 50 per cent. of the N present remained in solution. By coagulation at boiling temperature of the solution weakly acidified with acetic acid, only 69 per cent. of the N present was precipitated.

M. B. Richards.

1464

ÅGREN, G. and GLOMSET, J. A study of phosphopeptides from casein. 1. Methods of fractionation. *Acta chem. scand.*, 1953, **7**, 1071–1080.

1465

LOEFFLER, W. and WUNDERLY, C. The staining of proteins and lipoids after electrophoresis on filter paper. *J. Clin. Pathol.*, 1953, **6**, 282–285. [Med. Clin., Univ. Zürich.]

Azocarmine was the most suitable of 3 dyes used for staining serum protein fractions separated by electrophoresis. A method is described for staining lipid fractions with "Ciba" blue and Sudan black.—H. G. Bray.

1466

VISHNYAKOV, A. P., DOBROVOL'SKII, D. S. and ERMAKOV, N. V. Elektroforeticheskoe opredelenie fraktsii belka na bumage. [Electro-

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phoretic estimation of protein fractions on paper.] *Dokl. Akad. Nauk S.S.S.R.*, 1952, **87**, 1035-1038. [Nauch.-Issled. Inst. Pereliv. Krov., Leningrad.]

Strips of filter paper 3×35 cm. were fixed in a hermetically sealed glass tank, the bottom of which was covered with distilled water to give 100 per cent. humidity. The ends of the strips were immersed in 2 vessels at different heights in the tank. These vessels were fitted with needle electrodes separated from the buffer solutions contained in them by glass labyrinths. The filter paper passed over 2 glass rods and it was at these points that the drops of protein solution were placed. The papers to be used for electrophoresis were left for 24 hr. in the tank before test. Non-dialysed serum or plasma, 0.02 to 0.04 ml., was placed on the paper and treated for 6 to 8 hr. at 260 to 270 volts and 1.5 to 2.0 milliamps. The spots after development with a dye were not extracted as is normally done; instead, the amount of light passing through the spots was measured directly *in situ* by means of a specially constructed spectrophotometer. The whole apparatus and technique is claimed to be much simpler than electrophoretic apparatus now in use. W. Hughes.

1467

NIKKILA, E., HAAHTI, E. and PESOLA, R. On the technique of preparative electrophoresis of proteins in supporting medium (starch). *Acta chem. scand.*, 1953, **7**, 1222-1223. [Dept. Med. Chem., Univ. Helsinki.]

The preparation of the column is described. It was found advisable to make the run with the column held vertically. Bilirubin can be used for detection of the protein fractions, but if coloured fractions are not desired, ultraviolet fluorescence may be employed. At the end of the run the location of the bands can be estimated by pressing a filter paper strip against the side of the wet column and then staining it with bromophenol blue. Elution with an alkaline buffer containing glycine is recommended.—H. G. Bray.

1468

SONNET, J. and RODHAIN, J. Étude des protéines sériques par l'électrophorèse sur papier. 2. Reproductibilité des résultats. [Serum proteins studied by paper electrophoresis. 2. Reproducibility of results.] *Rev. belg. Pathol. Méd. exp.*, 1953, **23**, 5-13. [Clin. Méd. A, Univ. Louvain.] English summary.

1469

FISCHER, F. G. and DÖRFEL, H. Zur quantitativen Auswertung der Papierchromatogramme von Eiweiss-Hydrolysaten. [Quantitative evaluation of paper chromatograms of protein hydrolysates.] *Biochem. Ztschr.*, 1953, **324**, 544-566. [Chem. Inst., Univ. Würzburg.]

A procedure applicable to 5 to 10 mg. protein is described in detail. A one-dimensional procedure with buffered developing solvents and paper, similar to that described by McFarren and Mills (Abst. 1503, Vol. 22), is used. The dried chromatograms are sprayed with ninhydrin and then with a copper nitrate reagent, the spots are eluted with methanol and the colour intensity of the eluates is estimated spectrophotometrically.—H. G. Bray.

1470

SALANDER, R. C., PIANO, M. and PATTON, A. R. Accuracy of quantitative paper chromatography in amino acid analysis—Addendum. *Anal. Chem.*, 1953, **25**, 1252-1253. [Chem. Dept., Colorado Agric. and Mech. Coll., Fort Collins.]

An account of details supplementary to those given by Patton and Chism (Abst. 4464, Vol. 21). H. G. Bray.

1471

GIRI, K. V. and RAO, N. A. N. Circular paper chromatography. 7. A technique for the separation and estimation of "overlapping amino acids". *J. Indian Inst. Sci.*, 1953, **35**, 343-353. [Dept. Biochem., Indian Inst. Sci., Bangalore.]

"Overlapping" amino-acids are those which do not form discrete bands on circular paper chromatograms developed by mixtures of *n*-butanol, acetic acid and water (40 : 10 : 50). These mixed bands are cut out and used as the "wick" by means of which a second chromatogram is irrigated, using as solvents pyridine and water (80 : 20), pyridine, amyl acetate and water (10 : 10 : 7), and pyridine, iso-amyl alcohol and water (10 : 5 : 5). By this technique the following groups can be separated and estimated : leucine, isoleucine, valine, methionine ; γ -aminobutyric acid, tryptophan ; α -amino butyric acid, tyrosine ; β -alanine, proline ; glutamic acid, threonine ; glycine, serine, aspartic acid ; arginine, asparagine ; lysine, histidine. Results are given for the analysis of hydrolysates of casein and edestin.—H. G. Bray.

1472

HILLER, E. and ZINNERT, F. Ein Beitrag zur quantitativen Bestimmung von Aminosäuren in Papierchromatogrammen. 2. [Quantitative estimation of amino-acids in paper chromatograms. 2.] *Biochem. Ztschr.*, 1953, **324**, 93-95. [I. Med. Klin., Univ. Munich.]

A brief account of the application of a technique previously described (Abst. 1217, Vol. 23) to protein hydrolysates.—H. G. Bray.

1473

LANDUCCI, J. M. and PIMONT, M. Sur le microdosage des acides aminés par la méthode de Woïwood. Application aux spots chromatographiques. [Micro-estimation of amino-acids by Woïwod's method. Application to spots in a chromatogram.] *Bull. Soc. Chim. biol.*, 1953, **35**, 1041-1044.

The nature of the copper phosphate used in Woïwod's method (Abst. 4350, Vol. 19) was investigated and a procedure which gives reproducible results is described.—H. G. Bray.

1474

JEPSON, J. B. and SMITH, I. 'Multiple dipping' procedures in paper chromatography: a specific test for hydroxy-proline. *Nature*, 1953, **172**, 1100-1101. [Courtauld Inst. Biochem., Middlesex Hosp. Med. Sch., London, W.1.]

1475

MORRIES, P. and STUCKEY, R. E. The chromatographic determination of glutamic acid in wheat gluten hydrolysates. *Analyst*, 1953, **78**, 636-640. [British Drug Houses, Ltd., Graham St., London, N.1.]

The precision of the described paper chromatography method for the estimation of glutamic acid in gluten hydrolysates, with phenol, collidine or isobutyric acid as mobile phase, is ± 12 per cent. A second method is described in which total dicarboxylic acids, aspartic plus glutamic, are estimated by adsorption of Amberlite LR-4B, aspartic acid being subsequently estimated by paper chromatography with a phenol-water developing solvent. In control experiments recoveries of total dicarboxylic acids ranged from 98.4 to 102.2 per cent. and those of glutamic acid added to gluten from 98.5 to 101.5 per cent.—H. G. Bray.

1476

CHANTRENNE, H. Sur l'emploi de la N-éthyl-maléimide dans la chromatographie de mélanges d'acides aminés contenant de la cystine. [Use of N-ethylmaleimide in the chromatography of amino-acid mixtures containing cystine.] *Arch. internat. Physiol.*, 1953, **61**, 558-559. *Proc. [Lab. Chim. Biol., Fac. Sci., Univ. Brussels.]*

1477

MEISEL', M. N. and TROFIMOVA, N. P. Novyi mikrobiologicheskii metod opredeleniya triptofana. [A new microbiological method of estimating tryptophan.] *Mikrobiologiya*, 1953, **22**, 385-390. [Inst. Mikrobiol., Acad. Nauk SSSR, Moscow.]

Saccharomyces cerevisiae was chosen as the indicator organism, since in addition to biotin and pantothenic acid the strain used, T1, requires the presence of tryptophan for development. Preliminary tests in which a Rider medium was used as the base showed that none of the water-soluble vitamins tested could replace tryptophan. In conjunction with the Rider medium a yeast hydrolysate was used, in which the tryptophan was destroyed by ultraviolet radiation, all the other vitamins and amino-acids required for growth of the organism being left unaltered. It was shown that none of the other amino-acids composing the yeast hydrolysate could replace tryptophan or favour its biosynthesis. Purine and pyrimidine bases were similarly inactive. Compounds related to tryptophan were tested for biological activity, and of these only indole was found to be capable of replacing tryptophan. Indole was, however, easily removed by extraction of the aqueous extract with ethyl ether. The nutrient medium was therefore made up to contain the following percentages: sucrose 2, $(\text{NH}_4)_2\text{SO}_4$ 0.3, $\text{MgSO}_4 \cdot 7\text{H}_2\text{O}$ 0.07, NaCl 0.05, $\text{Ca}(\text{NO}_3)_2$ 0.04, KH_2PO_4 0.1, K_2HPO_4 0.01, irradiated yeast autolysate 0.5. The sensitivity of the method is 0.5 $\mu\text{g.}$ per ml. The advantage of the method is that there is no need to use a complex nutrient medium containing pure vitamins and amino-acids.—W. Hughes.

1478

DOBYNS, B. M. and BARRY, S. R. The isolation of iodinated amino acids from thyroid tissue by means of starch column chromatography. *J. Biol. Chem.*, 1953, **204**, 517-531. [Dept. Surg., Sch. Med., W. Reserve Univ., Cleveland, Ohio.]

The starch column chromatography technique of Moore and Stein (Absts. 3939, Vol. 18; 1704, Vol. 19) was employed for the separation. Radioactive thyroid tissue was obtained from rats which had received injections of ^{131}I shortly before death. An alkaline solvent of *n*-butanol, propanol and 0.05 *N* Na_2CO_3 (1 : 2 : 1) was found preferable to an acid solvent and the addition of $\text{Na}_2\text{S}_2\text{O}_3$ just before hydrolysis and to the hydrolysed sample just before it was run on to the starch column overcame undesirable reactions such as interchange of I between compounds, freeing of I from amino-acids and synthesis of compounds *in vitro*. Thyroxine, diiodotyrosine, monoiodotyrosine, inorganic iodide and 2 unknown iodinated compounds were separated. There was progressive accumulation of ^{131}I in the thyroxine fraction from the thyroid in groups of animals killed 4, 24 and 48 hr. after the administration of ^{131}I . One of the unknown compounds, at first thought possibly to be identical with an unknown compound

recently identified by Gross and Pitt-Rivers (*Lancet*, 1952, **262**, 439) as triiodothyronine, has been proved by work performed since the above paper was prepared not to be this compound.

W. Godden.

1479

BLASS, J., MACHBOEUF, M. and REBEYROTTE, P. Application de l'électrorhéophorèse à l'identification de divers amines biologiques dans les mélanges d'acides aminés. [Application of electrophoresis to the identification of biological amines in mixtures of amino-acids.] *Bull. Soc. Chim. biol.*, 1953, **35**, 953-957. [Serv. Chim. Biol., Inst. Pasteur, Paris.]

By means of the procedure described ethanolamine and glucosamine can be identified when mixed with amino-acids. It is suggested that electrophoresis may be used for "second-dimensional" separation of amino-acids which are not sufficiently separated by one-dimensional paper chromatography.—H. G. Bray.

1480

MELLON, E. F., KORN, A. H., VIOLA, S. J., MILLER, N. and HOOVER, S. R. Isolation of amino acids by distillation of the acetylated amino acid ethyl esters. *J. Amer. Chem. Soc.*, 1953, **75**, 5524-5528. [E. Reg. Res. Lab., Philadelphia, Pa.]

Amino-acids in protein hydrolysates were acetylated and their ethyl esters were prepared and separated by methods which are outlined. Difficulties were encountered in the preparations, but enough material was obtained to show that separation of fractions rich in alanine, valine, leucine, isoleucine, proline, aspartic acid, glutamic acid, methionine and phenylalanine was possible. From selected fractions alanine, valine, leucine and isoleucine were obtained in pure form.—D. Harvey.

1481

FOLKES, B. F. The *p*-hydroxydiphenyl test for acetaldehyde: the determination of alanine and threonine in protein hydrolysates. *Analyst*, 1953, **78**, 496-498. [Dept. Botany, Univ. Bristol.]

A modified procedure for the estimation of acetaldehyde is described. Alanine is estimated by a modification of the procedure of Virtanen and Rautanen (Abst. 37, Vol. 17): the protein hydrolysate is treated with ninhydrin and acetaldehyde is aspirated into sodium bisulphite for estimation. Interference by other amino-acids is considered. Threonine is estimated by a modification of the method of Winnick (*J. Biol. Chem.*, 1942, **142**, 461): the protein hydrolysate is treated with periodic acid in a Conway unit, the acetaldehyde formed diffuses into bisulphite and is then estimated by the method described.—H. G. Bray.

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1482

JACKSON, J. E. Determination of primary fatty amines in amine mixtures. Potentiometric titration techniques. *Anal. Chem.*, 1953, **25**, 1764-1765. [Chem. Labs., General Mills, Inc., Minneapolis, Minn.]

1483

ANASTASSIADIS, P. A. and COMMON, R. H. Studies on the glycoproteins of the domestic fowl. 1. A modification of the method of Elson and Morgan for the determination of hexosamine, and its applicability to tissue hydrolyzates. *Canad. J. Chem.*, 1953, **31**, 1093-1107. [Fac. Agric., McGill Univ., Macdonald College, Que.]

See also Abst. 2221.

Lipoid Constituents

1484

PINSKY, A. and GRÜNPETER, A. A modification of the van Gulik method for the determination of fat in soft cheese. *Analyst*, 1953, **78**, 621-622. [Dairy Res. Lab., Agric. Res. Stat., Rehovot, Israel.]

It was found that the Van Gulik method (see, e.g., *Nederlands Melk Zuiveltijdschr.*, 1948, **2**, 99), modified by increasing the sp. gr. of the H₂SO₄ to 1.70, was satisfactory for a soft white cheese produced in Israel.—H. G. Bray.

1485

KASTURI, T. R., NARAYANAMURTY, N. L. and IYER, B. H. Micro-determination of hydrogenation-iodine-number of vegetable oils. *J. Indian Inst. Sci.*, 1953, **35**, 339-342. [Dept. Org. Chem., Indian Inst. Sci., Bangalore 3.]

1486

MENDELOWITZ, A. and RILEY, J. P. The spectrophotometric determination of long-chain fatty acids containing ketonic groups, with particular reference to licanic acid. *Analyst*, 1953, **78**, 704-709. [Dept. Oceanography, Univ. Liverpool.]

1487

BÖHME, H. and OFFER, H. Zum Nachweis der Adipinsäure. [Detection of adipic acid.] *Ztschr. Lebensmittel-Untersuch. Forsch.*, 1953, **97**, 173-177. [Inst. Pharm. Chem., Univ. Marburg a. d. Lahn.]

1488

HADORN, H., JUNGKUNZ, R. and BIEFER, K. W. Überprüfung des Erucasäure-Nachweises in Ölmischungen nach dem Oxydationsverfahren. [Study of tests for erucic acid in oil

mixtures by the oxidation process.] *Ztschr. Lebensmittel-Untersuch. Forsch.*, 1953, **97**, 365-373. [Lab. V.S.K., Basle.]

1489

ISHERWOOD, F. A. and HANES, C. S. **Separation and estimation of organic acids on paper chromatograms.** *Biochem. J.*, 1953, **55**, 824-830. [Low Temperature Res. Stat., Univ. Cambridge.]

Single-phase *n*-propanol-ammonia mixtures are used as developing solvents, the concentrations depending on the acids studied, e.g., 70:30 (v/v) for lower fatty acids, propanol: ammonia: water 60:20:20 for dicarboxylic acids. Spraying reagents used are thymol blue and ammoniacal AgNO₃. A method is described for the estimation of ammonium salts of organic acids separated by paper chromatography. The areas of paper containing the salts are cut out and extracted with 35 per cent. ethanol in a stream of CO₂-free air under carefully controlled conditions. A thymol blue glycine reagent is added and the colour intensity measured. The colour of the indicator is inversely proportional to the concentration of the salt from about 80 to 20 per cent. neutralisation. The relation between the quantity $\log [(1/R_F) - 1]$ and the number of carbon atoms in the acids is discussed. An apparatus is described for purification of paper before use.—H. G. Bray.

1490

DUNCAN, R. E. B. and PORTEOUS, J. W. **The identification and determination of the lower straight-chain fatty acids by paper partition chromatography.** *Analyst*, 1953, **78**, 641-646. [Dept. Biol. Chem., Univ. Aberdeen.]

The developing solvent used for ascending paper chromatography is the organic phase of *n*-butanol saturated with 1.5 N ammonia. The indicator spray is a mixture of methyl red and bromothymol blue in an ethanolic formalin solution. The conditions for obtaining reproducible chromatograms from mixtures in which the amount of each acid ranges from 5 to 80 μ g. are considered.

H. G. Bray.

1491

NIJKAMP, H. J. **A simple chromatographic method for the determination of the C₁₀-C₂₀ saturated straight-chain fatty acids.** *Nature*, 1953, **172**, 1102-1103. [Lab. Animal Physiol., Agric. Univ. Coll., Wageningen, The Netherlands.]

The acids are separated quantitatively on a 9-cm. column of silica gel. The column is tinted with bromothymol blue, neutralised with methanolic ammonia solution and saturated with methanol and the chromatogram is developed with *iso*-octane saturated with 95 per cent. methanol.

Mixtures containing about 0.5 mg. of the different acids gave recoveries of 95 to 105 per cent. of each acid.—G. A. Garton.

1492

EMMERIE, A. **On the paper chromatography of α -glyceryl ethers.** *Rec. Trav. chim. Pays-Bas*, 1953, **72**, 893-896. [Lab. Hyg., Univ. Utrecht.]

α -Glyceryl esters of cod liver oil are oxidised with periodic acid and the resulting aldehydes are extracted with benzene and separated by chromatography on filter paper impregnated with paraffin or cetyl acetate. The mobile phase is aqueous methanol or ethanol and the detecting agent a mixture of fuchsin and sulphurous acid which produces red-violet spots. An ascending technique is used.—H. G. Bray.

1493

KERR, L. M. H. and BAULD, W. S. **The chromatographic separation of free and combined plasma cholesterol.** *Biochem. J.*, 1953, **55**, 872-875. [Dept. Biochem., Univ. Edinburgh.]

Cholesterol may be separated from its esters on an alumina column with light petroleum and then benzene as mobile phase. Cholesteryl esters may be estimated directly by means of the Liebermann Burchard reaction. A method is described for the estimation of free and combined cholesterol in plasma.—H. G. Bray.

1494

HUTT, H. H., WEATHERALL, H. and CULSHAW, T. **The determination of total phosphatide in commercial lecithin.** *Analyst*, 1953, **78**, 712-716. [J. Bibby and Sons, Ltd., King Edward St., Liverpool 3.]

An improvement of an earlier method (Title 32, Vol. 14) for estimating acetone-insoluble matter is described. The difference between matter insoluble in acetone estimated by this method and matter insoluble in light petroleum is suggested as giving a suitable measure of phosphatide content.

W. Godden.

1495

HADORN, H. and JUNGKUNZ, R. **Über eine gravimetrische Cholinbestimmungsmethode sowie über den Gehalt an Lecithin, Sphingomyelin und Kephalin in Hühnereiern und Eipulvern.** [Gravimetric estimation of choline and the lecithin, sphingomyelin and cephalin content of hen eggs and egg powders.] *Mitt. Geb. Lebensmittel. Hyg.*, 1953, **44**, 333-347. [Lab. VSK, Basle.] French and English summaries.

Total lipid is extracted by means of a mixture of ethanol and benzene and weighed. The extracted material is hydrolysed with HCl in an autoclave and choline is precipitated as its reineckate and

N.A. and R., April 1954

weighed. Lipid phosphoric acid and N can be estimated by application of saponification and Kjeldahl procedures, respectively, to the total lipid fraction. From these data the lecithin, cephalin and sphingomyelin content of egg powders can be calculated. Whole egg powders contained 1.60 to 1.92 per cent. of choline.

H. G. Bray.

See also Abst. 1465.

Other Organic Constituents

1496

BERGNER, K. G. and SPERLICH, H. Anwendungen der Papierchromatographie bei der Untersuchung von Lebensmitteln. 2. Nachweis und Reinheitsprüfung von Glykolen und ähnlichen Verbindungen. [Applications of paper chromatography in the study of foods. 2. Detection and tests for purity of glycols and similar compounds.] *Ztschr. Lebensmittel-Untersuch. Forsch.*, 1953, **97**, 253-263. [Chem. Landesuntersuchungsanst., Stuttgart.]

1497

ENGLIS, D. T., FISCH, E. J. and BASH, S. L. Determination of diacetyl. *Anal. Chem.*, 1953, **25**, 1373-1375. [Univ. Illinois, Urbana.]

Diacetyl, 0.1 to 1.0 mg., is distilled from the sample under investigation and, by treatment with hydroxylamine and Na acetate, converted to dimethyl glyoxime, which can be estimated spectrophotometrically at 226 m μ .—H. G. Bray.

1498

BERRIDGE, N. J., ZIELINSKA, M. and BARRETT, J. Some notes on the determination of methyl ketones. *J. Sci. Food Agric.*, 1953, **4**, 472-477. [Nat. Inst. Res. Dairying, Univ. Reading.]

1499

FONNESU, A. Photometrische Anpassung für die Mikrobestimmung der Essigsäure im Harn. [Photometric adaptation for the micro-estimation of acetic acid in urine.] *Biochem. Ztschr.*, 1953, **324**, 512-516. [Inst. Allg. Pathol., Univ. Perugia.]

The urine is cleared and freed from reducing material, and evaporated, and the residue is esterified with methanol. The methyl acetate formed is distilled over free from most other esters. It is then saponified and impurities such as formic acid and H₂S are oxidised by K₂Cr₂O₇ in 50 per cent. H₂SO₄, and finally acetic acid is oxidised by adding AgNO₃ and increasing the H₂SO₄ concentration to 60 per cent. The amount of acetic acid present is calculated in terms of the difference

in the spectrophotometric extinction value caused by the last stage in the process. The method is applicable to from 0.1 to 1.0 mg. acetic acid and in 10 control experiments the average recovery was 96 per cent., the range being from 85 to 107 per cent.—H. G. Bray.

1500

HARPER, W. J. Direct chromatographic determination of acetic, propionic and butyric acids in cheese. *J. Dairy Sci.*, 1953, **36**, 808-816. [Dept. Dairy Technol., Ohio State Univ., Columbus.]

The method consists in chromatography on a specially prepared silicic acid column; the acids are eluted with mixtures of chloroform and butanol, the concentration of the latter being increased as development continues. Acids containing more than 5 carbon atoms are removed first and acetic acid last. Results obtained with this procedure were in good agreement with those given by a similar procedure in which the acids were separated from cheese by distillation before chromatography. In control experiments recoveries of added acids of more than 90 per cent. were obtained.—H. G. Bray.

1501

McROBERTS, L. H. Report on acetic and propionic acid mold inhibitors in bread. *J. Assoc. Off. Agric. Chem.*, 1953, **36**, 769-781. [Food and Drug Admin., Dept. Health, San Francisco, Calif.]

The method previously adopted (*ibid.*, 1951, **34**, 284) has been submitted to collaborative trials on milk bread and whole wheat bread with added propionate and Na diacetate. The results show that the method is adequate for general use in bread analysis. Lactic acid in amounts of 0.4 to 1.8 per cent. does not interfere in the estimation of acetic, propionic or butyric acid. There was no definite proof of the presence of butyric acid in the authentic milk bread.—W. Godden.

1502

VAN DUUREN, A. J. The determination of organic acids in plant material by means of paper chromatography. *Rec. Trav. chim. Pays-Bas*, 1953, **72**, 889-892. [Inst. Rationele Suikerprod., Bergen op Zoom.]

The solvent mixture used for the separation of oxalic, citric, tartaric, malonic, malic, succinic and lactic acid was propanol : ethanol : buffer (1.6 N with respect to ammonia and ammonium carbonate) in the proportion 10 : 60 : 30. Detection was by spraying first with 4 per cent. formaldehyde in ethanol and then with a solution of KI 0.3 per cent., KIO₃ 0.2 per cent. and starch

0.2 per cent., blue spots against a white background being obtained. An ascending technique was found to be preferable to a descending.

H. G. Bray.

1503

OWENS, H. S., GOODBAN, A. E. and STARK, J. B. **Fractionation of organic acids in sugar beets by ion exchange resins.** *Anal. Chem.*, 1953, **25**, 1507-1511. [W. Reg. Res. Lab., Bur. Agric. Indust. Chem., Albany 6, Calif.]

Amino-acids in beet juice are removed by treatment with Dowex-50 and other organic acids are then fractionated by using resin S (Permutit Corp., New York) and eluting with HCl. The order of appearance of the acids from beet is citric, oxalic, malic, glycollic. Lactic and pyrrolidone carboxylic acids are also found, but may be artifacts.

H. G. Bray.

1504

SCHENKER, H. H. and RIEMAN, W. (III). **Determination of malic, tartaric, and citric acids in fruit by ion exchange chromatography.** *Anal. Chem.*, 1953, **25**, 1637-1639. [Sch. Chem., Rutgers Univ., New Brunswick, N.J.]

The acids are separated by using the resin Dowex-1 and eluting with solutions of Na tetraborate, boric acid and NaNO₃. The fruit acids in the eluates are estimated by oxidation with permanganate.—H. G. Bray.

1505

MOIR, K. W. **The determination of oxalic acid in plants.** *Queensland J. Agric. Sci.*, 1953, **10**, 1-3. [Chem. Lab., Div. Plant Indust.]

1506

DAGLEY, S. and DAWES, E. A. **Enzymic estimation of citric acid.** *Biochem. J.*, 1953, **55**, xxxv-xxxvi. [Dept. Biochem., Univ. Leeds.]

1507

GEY, K. F. **Zur quantitativen Bestimmung der Zitronensäure in Blut und Urin mittelst Pentabromazetonbildung. [Quantitative estimation of citric acid in blood and urine by conversion to pentabromoacetone.]** *Internat. Ztschr. Vitaminforsch.*, 1953, **25**, 21-41. [Hoffmann La Roche and Co., AG., Basle.] French and English summaries.

After a critical examination of different methods a technique was evolved for routine estimation of citric acid in concentrations of 25 to 200 μ g., with an error of ± 4 per cent. Recoveries of citric acid added to blood and urine were from 95 to 102 per cent. The most suitable protein precipitant was found to be 10 per cent. trichloroacetic acid.

M. B. Richards.

1508

SMITH, M. J. H. and TAYLOR, K. W. **The separation of α -keto acids in blood and urine by paper chromatography.** *Biochem. J.*, 1953, **55**, xxx-xxxi. [Dept. Chem. Pathol., King's Coll. Hosp. Med. Sch., Denmark Hill, London.]

1509

BRUENING, C. F. **The spectrophotometric identification of dehydroacetic acid in cheese.** *J. Assoc. Off. Agric. Chem.*, 1953, **36**, 1029. [Food and Drug. Admin., Dept. Health, Chicago, Ill.]

1510

AUGUSTINSSON, K. B. and GRAHN, M. **The separation of choline esters by paper chromatography.** *Acta chem. scand.*, 1953, **7**, 906-912. [Inst. Org. Chem., Univ. Stockholm.]

The solvent used is a mixture of *n*-butanol, ethanol, acetic acid and water (8:2:1:3) and the compounds are detected by means of a solution of dipicrylamine in acetone, which gives dark yellow spots against a pale yellow background. Acetylcholine can be estimated quantitatively by elution and the application of a hydroxylamine-FeCl₃ colour reaction, the details of which are described, to the eluate.—H. G. Bray.

1511

CALDWELL, P. C. **The separation of the phosphate esters of muscle by paper chromatography.** *Biochem. J.*, 1953, **55**, 458-467. [Dept. Biophys., University Coll., London.]

1512

BOSTRÖM, H. and MÄNSSON, B. **A simplified small-scale method for the preparation of chondroitin sulphuric acid from cartilage.** *Ark. Kemi*, 1953, **6**, 17-21. [Chem. Dept., Karolinska Inst., Stockholm.]

The cartilage is extracted with 2 per cent. NaOH and, after neutralisation with acetic acid, the extract is deproteinised by being passed, under air pressure of 2 to 4 atm., through steel tubes packed with kaolin. The solution is then concentrated *in vacuo* and the Na salt is precipitated with ethanol. The yield of it is from 30 to 40 mg. per g. fresh cartilage.—D. Harvey.

1513

THALER, H. and SOMMER, G. **Studien zur Farbstoffanalytik. 4. Die papierchromatographische Trennung wasserlöslicher Teerfarbstoffe. [Estimation of pigments. 4. Separation of water-soluble coal-tar pigments by paper chromatography.]** *Ztschr. Lebensmittel-Untersuch. Forsch.*, 1953, **97**, 345-365. [Deutsch. Forschungsanst. Lebensmittelchem., Munich.]

Special attention has been given to pigments used to colour foods.

See also Absts. 1489, 1490.

Inorganic Constituents

1514

WICHMANN, H. J. **Ash determinations in foods with an alkaline balance. 6. Reaction of sodium carbonate with calcium phosphates in the ashing of milk.** *J. Assoc. Off. Agric. Chem.*, 1953, **36**, 979-992. [Food and Drug Admin., Dept. Health, Washington, D.C.]

Earlier work with mixtures of pure Ca phosphates and alkali carbonates (Absts. 1834, Vol. 12 ; 2816, Vol. 13) has been extended to a study of the ash from slightly soured milk before and after neutralisation and with and without the addition of sodium lactate. The water-insoluble ash of unneutralised milk contained mixed NaCa and KCa phosphate with very little CO_2 . This introduction of both Na and Ca into the insoluble ash of milk confirms the findings of Hillig (Abst. 2783, Vol. 11). The neutralisation of milk with Na_2CO_3 or the addition of Na lactate introduces CO_2 into the insoluble ash as basic alkali-Ca phosphates or carbonated hydroxyapatite. The results obtained depend on the degree of neutralisation and the temperature of ashing.—W. Godden.

1515

BREYER, B. and McPHILLIPS, J. **The indirect polarographic determination of calcium by chloranilic acid.** *Analyst*, 1953, **78**, 666-669. [Physicochem. Labs., Fac. Agric., Univ. Sydney.]

Calcium is precipitated by chloranilic acid and, without removal of the precipitate, the excess reagent is estimated polarographically. The concentration of Ca which may be used ranges from $1.3 \times 10^{-4} M$ to $1.2 \times 10^{-2} M$ and the method is accurate to within ± 3 per cent. Co, Zn, Pb, Mn, Cd, Ni, Al, Cu and Ag ions interfere : Li, Ba, Mg, Cr, Sr, ferric and mercuric ions interfere only if present in concentrations greater than a critical value. The method is applicable to serum and to milk.—H. G. Bray.

1516

POWELL, F. J. N. **The determination of calcium in biological fluids by flame photometry.** *J. Clin. Pathol.*, 1953, **6**, 286-289. [Pathol. Unit, St. James's Hosp., Leeds.]

1517

CHEN, P. S. (Jr.) and TORIBARA, T. Y. **Determination of calcium in biological material by flame photometry.** *Anal. Chem.*, 1953, **25**, 1642-1644. [Sch. Med. Dent., Univ. Rochester, N.Y.]

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Procedures are described which are applicable to serum, serum ultrafiltrate and urine.

H. G. Bray.

1518

FALES, F. W. **A micromethod for the determination of serum calcium.** *J. Biol. Chem.*, 1953, **204**, 577-585. [Dept. Biochem., Sch. Med., Emory Univ., Emory University, Ga.]

Ca can be estimated in 0.1 ml. serum by direct titration with standard disodium ethylenediamine tetra-acetate, with ammonium purpurate as indicator. The end-point is found graphically from spectrophotometric readings taken during the titration. The titration takes only a few minutes and the method is applicable also to macro-estimation of serum Ca. Mg in the amounts usually present does not interfere, and the titration is equally applicable to normal serum and serum with a high bilirubin content.—W. Godden.

1519

MULLIGAN, W. and JENNINGS, F. W. **A semi-micro method for the estimation of serum calcium by direct titration.** *J. Comp. Pathol.*, 1953, **63**, 283-285. [Vet. Sch., Univ. Glasgow.]

A method using disodium ethylenediamine tetra-acetate and murexide as indicator; it is applicable to 0.5 ml. serum.—H. G. Bray.

1520

WILSON, A. A. **The use of ethylene diamine tetra-acetate (EDTA) in the determination of calcium and magnesium in urine.** *J. Comp. Pathol.*, 1953, **63**, 294-299. [Res. Dept., Vet. Sci. Div., Boots Pure Drug Co., Ltd., Thurgarton, Notts.]

The titrimetric method described is accurate to within 5 per cent. and is applicable to human and bovine urine.—H. G. Bray.

1521

IVE, T. **Hurtigmetode til bestemmelse af bicarbonat og kloridindhold på legems vædske. [Rapid methods for estimating bicarbonate and chloride in body fluids.]** *Nord. Med.*, 1953, **50**, 1617-1619. [Kommunehosp., Copenhagen.] English summary.

The methods are slight modifications of those recommended by Scribner and his colleagues (Titles 1444, 5834, Vol. 20).—I. Leitch.

1522

FORBES, G. B., REID, A., BONDURANT, J. and ETHERIDGE, J. **Estimation of total body chloride in young infants by radiobromide dilution.** *Proc. Soc. Exp. Biol. Med.*, 1953, **83**, 871-872. [Dept. Paediat., Southwestern Med. Sch., Univ. Texas, Dallas.]

1523

KOMLEV, A. I. and TSIMBALISTA, L. I. *Primenenie osadochnoi khromatografii v kachestvennom polumikroanalize. [Application of precipitation chromatography in qualitative semimicro-analysis.] Zh. Anal. Khim.*, 1953, **8**, 217-219. [Lvov. Gosud. Univ. Im. I. Franko.]

Chlorides, iodides and bromides are separated chromatographically on a column 1 cm. long and containing about 0.1 to 0.2 g. Al_2O_3 mixed with 1 per cent. by weight of AgNO_3 or Ag_2SO_4 . Three drops of a solution as weak as 0.001 *N* of the respective ions are sufficient to give a chromatogram. The principle is precipitation of the halide by the silver salt, separation depending on the difference in the solubilities of the silver halides. The chromatograms are developed in sunlight; the first zone is yellow (AgI), the second blue-grey (AgBr) and the third violet-grey (AgCl). Limits of identification are 8 μg . for I, 14 to 15 μg . for Br and Cl, and the limiting concentrations are 1 : 7000 for I and 1 : 4000 for Cl and Br.

Ag, Hg and Pb are chromatographically separated on an Al_2O_3 column moistened with KI solution. Three zones, yellow (AgI), green (Hg_2O_2) and yellow (PbI_2), are obtained. Mixtures such as Bi-Cd, Cu-Cd and Sn-Sb are separated by using a saturated solution of Na_2S or $(\text{NH}_4)_2\text{S}$ as precipitant.—W. Hughes.

1524

SAMSON, S. *A new method for the quantitative determination of chloride in plant material. Nature*, 1953, **172**, 1042. [Agric. Exp. Stat., Groningen, Holland.]

An electrometric titration procedure is described. Two silver-silver chloride electrodes dip into an unfiltered extract of ground or dried plant material which is titrated with AgNO_3 . The end-point is indicated by an abrupt change in the direction of the galvanometer deflection.—H. G. Bray.

1525

HOSTE, J., EECKHOUT, J. and GILLIS, J. *Spectrophotometric determination of copper with cuproine. Anal. chim. Acta*, 1953, **9**, 263-274. [Lab. Anal. Chem., Univ. Ghent.] French and German summaries.

The spectrophotometric properties of the copper complex with 2 : 2'-diquinolyl (cuproine) were studied together with its partition coefficient between water and isoamyl alcohol, its stability with respect to colour and the influence of temperature, ions and excess reagent on its formation. Analytical procedures are described for the estimation of Cu in plants, animal tissues, blood and water, lampblack and steel.—H. G. Bray.

1526

FORSTER, W. A. *The determination of copper in plant material. Analyst*, 1953, **78**, 614-616. [Agric. Res. Counc. Unit Plant Nutrit., Long Ashton Res. Stat., Bristol.]

Details are given of a colorimetric method using diethyl-dithiocarbamate; ammonium ethylenediamine tetra-acetate is used to prevent interference by Co, Fe, Mn and Ni. Al, Zn, Ca, Mg and P do not interfere. CCl_4 is used to extract the coloured complex. The method gives results in good agreement with those obtained with a dithizone procedure.—H. G. Bray.

1527

HUBBARD, D. M. and SPETTEL, E. C. *Microdetermination of copper in biological material. Improved dithizone - polarographic method. Anal. Chem.*, 1953, **25**, 1245-1247. [Kettering Lab., Dept. Prev. Med., Coll. Med., Univ. Cincinnati, Ohio.]

Urine samples, 100 ml. or less, and blood and tissue specimens, 10 g. or less, are wet-ashed and Cu is extracted with a solution of dithizone in CHCl_3 . The extract is washed with KI and HCl and the complex is decomposed by treatment with acid bromine water. The Cu is thus transferred to the aqueous phase, which is evaporated to dryness; the residue is dissolved in a citrate buffer and the solution is examined polarographically.—H. G. Bray.

1528

BEVERIDGE, J. S., HUNTER, G. J. and MACNULTY, B. J. *The determination of microgram quantities of fluoride. 2. The determination of fluoride in waters and sewage effluent using the aluminium - haematoxylin complex. Anal. chim. Acta*, 1953, **9**, 330-337. [Chem. Inspectorate, Minist. Supply, Kidbrooke, London.] French and German summaries.

It was shown that the method previously described by the authors (*Anal. chim. Acta*, 1953, **8**, 351) is applicable to the estimation of amounts of F down to 0.1 p.p.m. in sea, river and potable waters and in sewage effluent, without previous separation by distillation. For sea water a calibration curve using artificial sea water is advisable. Values are given for waters of some British rivers and for potable water from different districts.

H. G. Bray.

1529

ICKEN, J. M. and BLANK, B. M. *Determination of fluorides. Spectrophotometric adaptation of method of Association of Official Agricultural Chemists. Anal. Chem.*, 1953, **25**, 1741-1742. [Food Res. Labs., Inc., Long Island City, N.Y.]

The fluoride is isolated by distillation and the neutralised distillate is treated with a thorium alizarin reagent, the absorbance of the mixture being measured spectrophotometrically at 525 m μ .
H. G. Bray.

1530

GOL'DBERG, G. S. K opredeleniyu ftora v zubakh. [Estimation of fluorine in teeth.] *Stomatologiya*, 1953, No. 2, 8-9. [Kaf. Obshch. Khim., Med. Stomatol. Inst., Leningrad.]

Three methods were used for the estimation of fluorine in teeth: (a) an ashing method for estimating inorganic F; (b) a method involving extraction with glycerol plus alkali to estimate organic F; (c) the Tananaev method which involves distillation of the F as fluosilicic acid into alcoholic potash. All three methods gave identical results, 0.38 per cent. No F was detected in the glycerol-alkali aqueous extract, which indicates that all the F is present in inorganic form. There is no need to ash the teeth prior to F estimation. Distillation using the Tananaev method is sufficient.

W. Hughes.

1531

CREMER, H. D. and VOELKER, W. Die Bestimmung von Fluor in Knochen und Zähnen. [Estimation of fluorine in bones and teeth.] *Biochem. Ztschr.*, 1953, **324**, 89-92. [Physiol. Chem. Inst., Univ. Mainz.]

The ashed material is distilled at 135° C. in the presence of perchloric acid and silica, the fluorine present distilling over in steam as H₂SiF₆. The distillate is concentrated to about 1 ml. and the F content is estimated in terms of the reduction in colour of an iron salicylate reagent. The method is applicable to the estimation of from 5 to 50 μ g. F, the error ranging from ± 4 to ± 2 per cent.—H. G. Bray.

1532

OLIVER, R. Use of a scintillation gamma counter for the estimation of iodine 131 in liquid samples. *Brit. J. Radiol.*, 1953, **26**, 663-664. [Dept. Radiotherapy, Churchill Hosp., Oxford.]

1533

VAN ZYL, A. A critical assessment of the distillation technique for the estimation of protein-bound iodine with suggested improvements. *S. African J. Med. Sci.*, 1953, **18**, 61-78. [Dept. Physiol., Univ. Witwatersrand, Johannesburg.]

After a critical consideration of different techniques and apparatus for the estimation of protein-bound iodine by distillation, the Barker method (Abst. 1630, Vol. 18) and the Connor apparatus (Abst. 1739, Vol. 19) were submitted to detailed tests. The technique was modified and the design of the apparatus was altered. A diagram

of the proposed still head is given. It is shown that chromic, chloride and sulphate ions may have effects on the final colorimetric reaction of arsenious acid and ceric sulphate which may be responsible in part for unsatisfactory I values. The new procedure is described in detail, and it is claimed that reproducible results can be obtained with 1-ml. samples of serum.—W. Godden.

1534

ELLIS, G. H. and DUNCAN, G. D. Distillation of micro quantities of iodine. Application to determination of protein-bound iodine in bovine blood serum. *Anal. Chem.*, 1953, **25**, 1558-1559. [U.S. Plant Lab., Bur. Plant Indust., U.S. Dept. Agric., Ithaca, N.Y.]

A suitable still is described, together with modifications of the method of Chaney (Abst. 52, Vol. 10). In control experiments recoveries of 96 per cent. were consistently obtainable.—H. G. Bray.

1535

WEYL, B. Methodischer Beitrag zur Serumeisenbestimmung nach Fuhrmann und Barkemeyer. (Vereinfachungen und Fehlerquellen.) [Fuhrmann and Barkemeyer's method of estimating iron in serum. Simplifications and sources of error.] *Ztschr. ges. inn. Med.*, 1953, **8**, 758-759. [Inn. Abt., Allg. Krankenhaus, Hamburg, Ochsenzoll.]

1536

PETERSON, R. E. Improved spectrophotometric procedure for determination of serum iron using 4, 7-diphenyl-1, 10-phenanthroline. *Anal. Chem.*, 1953, **25**, 1337-1339. [Dept. Biochem., Army Med. Serv. Grad. Sch., Walter Reed Army Med. Centre, Washington 12, D.C.]

A procedure is described which is applicable to serum, 1 to 2 ml., and to wet-ash digests of biological material. Diluted serum is treated with a mixture of trichloroacetic acid and thioglycolic acid and to the supernatant liquid is added a solution of 4 : 7-diphenyl-1 : 10-phenanthroline in amyl alcohol. The alcohol layer is separated and the colour is estimated at a wavelength of 535 m μ .

H. G. Bray.

1537

IRVING, H. M. and BUTLER, E. J. A reversion method for the absorptiometric determination of traces of lead with dithizone. *Analyst*, 1953, **78**, 571-578 (with discussion 578-580). [Inorg. Chem. Lab., South Parks Rd., Oxford.]

1538

WÄHLIN, E. Polarographic determination of traces of metals in organic material. Determination

of Pb, Cu, Cd, Ni, Zn and Fe. *Acta chem. scand.*, 1953, **7**, 956-968. [Royal Inst. Technol., Stockholm.]

A wet-ashing method is described for cellulose, carboxymethyl cellulose and dry yeast. Two samples are used for polarography. In one Pb is estimated after precipitation with ammonia in the presence of ferric iron, the precipitate being separated and dissolved in acid. In the second Fe is estimated in perchloric acid solution and Cu, Cd, Ni and Zn after the addition of hydroxylamine sulphate and pyridine.—H. G. Bray.

1539

GEE, A. and DEITZ, V. R. **Determination of phosphate by differential spectrophotometry.** *Anal. Chem.*, 1953, **25**, 1320-1324. [Nat. Bur. Standards, Washington 25, D.C.]

The high precision, 1 in 3000, of the method described is due to the fact that it is based on a comparison of the unknown with an accurate standard. The colour reaction used is the formation of a molybdivanadophosphate complex.

H. G. Bray.

1540

SCHOBER, R. and FRICKER, A. Eine neue Methode zur Bestimmung des Kaliumgehaltes der Milch. 2. Der Kaliumgehalt Allgäuer Kuhmilch bei normaler und durch Mastitis gestörter Sekretion. [New method for estimating potassium in milk. 2. Potassium content of milk of Allgäu cows, normal and with mastitis.] *Ztschr. Lebensmittel-Untersuch. Forsch.*, 1953, **97**, 177-182. [Staatl. Milchwirtsch. Lehr-Forschungsanst., Wangen, Allgäu.]

The method is a modification, with Na tetraphenyl borate, of that described in the first paper of the series (Abst. 1308, Vol. 23). The K content of the milk of individual cows varied between 137.7 and 177.3 mg. per 100 ml. and of mixed milks between 136.0 and 179.4 mg. per 100 ml. Variation due to mastitis was slight.—H. G. Bray.

1541

FLASCHKA, H. and AMIN, A. M. **A rapid volumetric method for the determination of micro-amounts of sodium and potassium.** *Chemist-Analyst*, 1953, **42**, 78-80. [Inst. Med. Chem., Univ. Graz, Austria.]

The mixed sulphates are obtained by the method of Wiesenberger (*Mikrochem. ver. Mikrochem. Acta*, 1942, **30**, 176) and weighed after ignition. In an aliquot of their solution K is precipitated by sodium tetraphenylboron and ignited to K metaborate. The K is estimated by boiling with excess of 0.01 N HCl and back titrating with 0.01 N NaOH. Na is estimated by difference.—W. Godden.

1542

KINGSLEY, G. R. and SCHAFFERT, R. R. **Direct microdetermination of sodium, potassium, and calcium in a single biological specimen.** *Anal. Chem.*, 1953, **25**, 1738-1741. [Dept. Physiol. Chem., Sch. Med., Univ. California, Los Angeles.]

A flame-photometric procedure is described which is applicable to serum and urine in which extreme ratios of Na, K, Ca, cholesterol, P, glucose and urea are present.—H. G. Bray.

1543

HERRMANN, R. **Flammenphotometrische Ultramikroanalyse von Na, K und Ca im Serum. [Ultramicro-estimation of Na, K and Ca in serum by flame photometer.]** *Ztschr. ges. exp. Med.*, 1953, **122**, 84-89. [Hautklin., Akad. ärztl. Forsch., Justus-Liebig-Hochsch., Giessen.]

1544

TERRIER, J. Le dosage du sel dans le pain. [Estimation of salt in bread.] *Mitt. Geb. Lebensmittel. Hyg.*, 1953, **44**, 403-405. [Lab. Cantonal, Geneva.] German and English summaries.

Enzyme Activity

1545

NARDI, G. L. **Radioactive measurement of proteolytic activity.** *Science*, 1953, **118**, 299-300. [Dept. Surg., Harvard Med. Sch., Boston, Mass.]

This is a method for estimation of proteolytic activity in body fluids. Albumin labelled with ^{131}I and free of unbound inorganic ^{131}I is digested for 20 min. with the proteolytic solution. The protein is then precipitated with 1 ml. β -naphthalenesulphonic acid and 1 ml. human serum albumin as carrier. The radio-activity of the supernatant solution is proportional to the proteolytic activity of the enzyme.—D. Duncan.

1546

BOWLBY, C., TUCKER, H., MILLER, B. S. and JOHNSON, J. A. **A comparison of methods for determining proteolytic activity.** *Cereal Chem.*, 1953, **30**, 480-491. [Dept. Flour and Feed Milling Indust., Kansas Agric. Exp. Stat.]

In evaluating the action of proteinase in dough 8 methods of estimation and 7 preparations were tested in 46 combinations. The preparations were a malted wheat flour, papain, trypsin, a bacterial enzyme, Protease-15, and 3 fungal preparations, Rhozyme P-11, Rhozyme-S and Protease-26. Regression coefficients between enzyme concentration and activity were calculated for each of the enzymes and methods. The variation in relative activity of the enzymes between methods was

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evaluated by comparing the ratios of the quantities of enzymes required for equivalent activity when analysed by the several methods.

There was generally good agreement for results by the Farinograph dough consistency technique used as control and the Hb-Kjeldahl, Hb-Beckman spectrophotometric, bromosulphalein and formol titration methods for malted wheat flour, Rhozyme P-11, Rhozyme-S and Protease-26. The two techniques involving gluten digestion and the one involving clotting of milk did not give results similar to those by the other methods.

There was no single relationship between the results for a particular method and those by the Farinograph for all preparations. If, however, preparations were classified according to origin, animal including bacterial, and fungal and plant, the results for Hb digestion, bromosulphalein and formol titration procedures were sufficiently well correlated with those of the Farinograph to give a good estimate of protease activity in dough.

D. Harvey.

1547

MCCANN, S. F. and LASKOWSKI, M. **Determination of trypsin inhibitor in blood plasma.** *J. Biol. Chem.*, 1953, **204**, 147-152. [Dept. Biochem., Sch. Med., Marquette Univ., Milwaukee, Wis.]

The method of Kunitz (*J. Gen. Physiol.*, 1947, **30**, 291) was found to be reasonably accurate if physiological saline was used as a diluent throughout the procedure. If the salt solution was below 0.03 M, the linear relation between the amount of inhibitor and the amount of trypsin inhibited no longer existed.—W. Godden.

1548

DELCOURT, A. A., RUBIN, C. E., PALMER, W. L. and KIRSNER, J. B. **Evaluation of a new technique for lipase determination.** *J. Lab. Clin. Med.*, 1953, **42**, 310-315. [Frank Billings Med. Clin., Dept. Med., Univ. Chicago, Ill.]

The method is that of Seligman and Nachlas (Abst. 72, Vol. 20) in which the substrate is β -naphthyl laurate. The phenol liberated is coupled with an azo salt to yield a dye which is estimated colorimetrically. The technique applied to blood was of no value in acute pancreatitis; the reason is discussed. Other clinical uses are discussed.—H. G. Bray.

Miscellaneous

1549

POMERANZ, J. and LINDNER, C. **Simple method for estimation of moisture in milled products.** *Chemist-Analyst*, 1953, **42**, 58-61. [Food Testing Lab., Haifa, Israel.]

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This method involves the use of a filter paper impregnated with cobaltous chloride and dried at 50° C. for 4 hr. The absolute moisture content can be estimated to within 0.5 per cent. by measuring the time the paper takes to acquire a red-lilac colour when in contact with the milled product. Relative moisture contents can be estimated by measuring the colour development in a given time compared with that attained when a sample of known moisture content is used.—W. Godden.

1550

HARTH, O., KREIENBERG, W. and MERTZ, D. **Einfaches Verfahren zur Wasserbestimmung in biologischem Material. [Simple method for estimating water in biological material.]** *Klin. Wochenschr.*, 1953, **31**, 905-907. [Physiol. Inst., Univ. Mainz.]

An accurate method of estimating the water content of tissue slices and other such biological material was based on the relationship of the solubility of xylene in ethanol to the amount of water present. The tissue was immersed in 94 per cent. ethanol and the change in water content could be read from a curve of response to additions of xylene, for which data are provided.

A. M. Copping.

1551

SOBEL, H. **Estimation of water content of small amounts of proteinaceous material.** *Anal. Chem.*, 1953, **25**, 1756. [Div. Labs., Cedars of Lebanon Hosp., Los Angeles, Calif.]

A colorimetric method using the Karl Fischer reagent.—H. G. Bray.

1552

RAMACHANDRAN, K. S., VENKATESWARA RAO, R. and BASU, K. P. **Determination of total solids in milk by Richmond's formula.** *Indian J. Dairy Sci.*, 1953, **6**, 111-119. [Indian Dairy Res. Inst., Bangalore.]

1553

SCOTT, D. **Food analysis. Identification of enzyme-desugarized egg solids.** *J. Agric. Food Chem.*, 1953, **1**, 1109-1111. [Vita-Zyme Laboratories, Inc., 546 W. Washington Blvd., Chicago 6, Ill.]

1554

TRUTWIN, H. **Bestimmung der Alterung des Fisches mittels jodometrischer Titration. 1. [Estimation of decomposition in fish by iodimetric titration. 1.]** *Ztschr. Lebensmittel-Untersuch. Forsch.*, 1953, **97**, 275-281. [Staat. Inst. Volksgesundheit, Stockholm.]

1555

NAFFZIGER, T. R. and MAHON, H. I. **Feed evaluation, determination of absorption capacity and fibrous material of pith and certain feed constituents.** *J. Agric. Food Chem.*, 1953, **1**, 847-851. [N. Reg. Res. Lab., Peoria, Ill.]

In a search for materials of high absorption capacity for use to hold molasses in mixed feeds, the following techniques were adopted. The term fibre does not mean crude fibre as ordinarily estimated but refers to material of elongated fibrous physical character. Materials were conditioned at 73° F. and 50 per cent. relative humidity for 16 hr. before use and then 3-g. samples were made into pellets by compression at 15,000 lb. per sq. in. Their absorption capacity for water and the time for maximum absorption were measured in a special apparatus, which is illustrated and described. The relative amounts of fibre particles of different sizes were estimated in an apparatus consisting of 4 cascading jars with sieves of mesh ranging from 8 to 200 in successive jars. Samples of pith prepared by different methods from sugarcane bagasse and of other absorbents used in livestock feeds were examined. Sugarcane pith prepared by wet screening had an absorption capacity about 2 to 3 times that of the commercial feed ingredients tested. Particle size affected both absorption capacity and pelleting characteristics.

W. Godden.

1556

GUADAGNI, D. G. and DIMICK, K. P. **Fruit flavours. Apparatus and procedure for separation and**

estimation of volatile components. *J. Agric. Food Chem.*, 1953, **1**, 1169-1170. [W. Reg. Res. Lab., Albany, Calif.]

1557

ADRIAN, E. D. **Flavour assessment. Physiological background of flavour assessment.** *Chem. and Indust.*, 1953, No. 48, 1274-1276. [Trinity Coll., Univ. Cambridge.]

1558

IRWIN, J. O. **Flavour assessment. A biometrician's viewpoint.** *Chem. and Indust.*, 1953, No. 51, 1348-1352. [Statistical Res. Unit, Med. Res. Council, London Sch. Hyg., Keppel St., London.]

1559

HARRIES, J. M. **Sensory tests and consumer acceptance.** *J. Sci. Food Agric.*, 1953, **4**, 477-482. [Scientific Adviser's Div., Minist. Food, Horseferry Rd., London.]

1560

EHRENBERG, A. S. C. and SHEWAN, J. M. **The objective approach to sensory tests of food.** *J. Sci. Food Agric.*, 1953, **4**, 482-490. [Inst. Psychiat., Maudsley Hosp., London, S.E.5.]

1561

DOVE, W. F. **A universal gustometric scale in D-Units.** *Food Res.*, 1953, **18**, 427-453. [Univ. Illinois Coll. Med., Chicago.]

MICROBIOLOGICAL

1562

PAPPENHAGEN, A. R., WIESE, A. C. and PETERSEN, C. F. **Development of a chick assay for un-**

known growth factors. *Poultry Sci.*, 1953, **32**, 931. *Proc.* [Univ. Idaho, Moscow.]

CLINICAL AND EXPERIMENTAL

1563

RAMASWAMY, S. S. and MOOKERJEE, G. C. **Applicability of the Du Bois height-weight formula for measurement of body surface of Indian subjects.** *Science*, 1953, **118**, 389-390. [Defence Sci. Organiz., Minist. Defence, Govt. India, New Delhi.]

From surface area measurements by the Du Bois tape method and computations for 18 healthy Indian males ranging in height from 5 ft. to 5 ft. 11½ in. and in weight from 90 to 158 lb. it was concluded that the Du Bois height and weight formula can be used for Indians although it was derived from studies of Europeans.

W. M. Deans.

1564

CAPRARO, V. **A new method of measuring oxygen consumed in the metabolism of small animals.** *Nature*, 1953, **172**, 815. [Lab. Biol., Ist. "C. Erba" Recherche Terap., Milan.]

An apparatus is described in which O₂ is supplied to the respiration chamber from an electrolytic cell the activity of which is automatically controlled by the pressure in the chamber, so as to limit the O₂ supply to the animal's requirements. The whole equipment is hermetically sealed.

W. Godden.

1565

MONCHE, J. **Nuevo aparato simplificado para la microdeterminación de gases en sangre, según**

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el método de Van Slyke y Neill. [New simplified apparatus for the micro-estimation of blood gases according to the method of Van Slyke and Neill.] *Rev. española Fisiol.*, 1953, 9, 129-134. [Inst. Fisiol., Fac. Med., Barcelona.] English summary.

1566

MORRISON, S. D. A method for the calculation of metabolic water. *J. Physiol.*, 1953, 122, 399-402. [Inst. Physiol., Univ. Glasgow.]

It was found possible to calculate metabolic water from respiratory metabolism data, with the equation

Metabolic water formed (g.) = $0.1998 \times \text{Litres } O_2 \text{ consumed} + 0.4692 \times \text{Litres } CO_2 \text{ produced} - 0.9700 \times \text{g. Urinary N.}$

By substituting some standard values, several convenient working equations are reached for estimation of metabolic water from total energy production. Experimental conditions affecting the validity of the equations are discussed.

D. Duncan.

1567

DENTON, A. E., GERSHOFF, S. N. and ELVEHJEM, C. A. A new method for cannulating the portal vein of dogs. *J. Biol. Chem.*, 1953, 204, 731-735. [Dept. Biochem., Coll. Agric., Univ. Wisconsin, Madison.]

The method consisted in the introduction into the portal vein, at a point about 1 in. from the liver, of a length of silicone-coated fine plastic tubing, "Geneflex" tubing, the other end of the tube being brought by a subcutaneous path to the exterior at a point behind the shoulder. Here it was filled with saline, tied off, and secured to the skin. Operative details are given.

Such a cannula has remained functioning for 6 to 8 weeks. Through it 10-ml. samples of portal vein blood were withdrawn, and 10 amino-acids were estimated in the plasma. Comparison of the results with those of contemporary samples from the radial vein showed that a much greater increase of amino-acid concentration could be detected in the portal vein than in the radial vein at different times after ingestion of a meal.—W. A. Greig.

1568

HELLMANN, H., MACK, R. E., SHRADER, E. L. and BUTZEN, J. Blood volume, method. *J. Lab. Clin. Med.*, 1953, 42, 815. *Proc.*

1569

CASTER, W. O., SIMON, A. B. and ARMSTRONG, W. D. A direct method for the determination of Evans Blue using zephiran as a solvent. *J. Lab. Clin. Med.*, 1953, 42, 493-498. [Dept. Physiol. Chem., Univ. Minnesota, Minneapolis.]

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Fresh heparinised plasma (20 μ l.) in a spectrophotometer cell is treated with a 12.8 per cent. solution of zephiran chloride and mixed, and the optical density of the mixture is measured. Most errors due to fat in the plasma are eliminated and those due to haemolysis can be corrected for by a formula given.—H. G. Bray.

1570

ROBERTS, L. N., SMILEY, J. R., SEARS, G. A. and MANNING, G. W. Plasma volume, measured by iodinated albumin, and T-1824. *Canad. Med. Assoc. J.*, 1953, 69, 510-519. [Dept. Med., Univ. W. Ontario, London.]

From the results of a comparative study of the 2 techniques it is concluded that the Evans Blue method should not be used for serial estimations. The radio-active iodinated human albumin method is simpler for clinical use.—H. G. Bray.

1571

ERICKSON, J. R., MCCORMICK, J. B. and SEED, L. An improved method for the determination of blood volume using radioactive iodinated human serum albumen. *Science*, 1953, 118, 595-596. [Isotope Lab., Augustana Hosp., Chicago, Ill.]

A simple procedure is described, which is safe and gives reproducible results for samples taken at short intervals.—H. G. Bray.

1572

FRANK, H. and GRAY, S. J. The determination of plasma volume in man with radioactive chromic chloride. *J. Clin. Invest.*, 1953, 32, 991-999. [Biophys. Lab., Harvard Med. Sch., Boston, Mass.]

The method described involves the injection of a solution of chromic chloride labelled with ^{51}Cr . This is bound to plasma proteins and after 5 min. samples of blood are withdrawn and their isotope concentration is measured with a suitable counter. The method is accurate to within 3 per cent. as compared with haemorrhage and transfusion experiments with known volumes of plasma.

For 21 adult males the mean circulating plasma volume was $2894 \text{ ml.} \pm 366$, the mean plasma volume per kg. $39.3 \text{ ml.} \pm 4.9$ and the mean plasma volume per sq. m. surface area $1515 \text{ ml.} \pm 157$. The principles of the estimation of ^{51}Cr are discussed.—H. G. Bray.

1573

GRAY, S. J. and FRANK, H. The simultaneous determination of red cell mass and plasma volume in man with radioactive sodium chromate and chromic chloride. *J. Clin. Invest.*, 1953, 32, 1000-1004. [Biophys. Lab., Harvard Med. Sch., Boston, Mass.]

The subject's red cells are labelled *in vitro* with sodium chromate containing ^{51}Cr and the plasma proteins with injected labelled chromic chloride as described in the preceding Abst. The radioactivity of cells and plasma in samples of blood collected after about 5 min. are then measured.

H. G. Bray.

1574

REEVE, E. B., GREGERSEN, M. I., ALLEN, T. H. and SEAR, H. **Distribution of cells and plasma in the normal and splenectomized dog and its influence on blood volume estimates with P^{32} and T-1824.**

REEVE, E. B., GREGERSEN, M. I., ALLEN, T. H., SEAR, H. and WALCOTT, W. W. **Effects of alteration in blood volume and venous hematocrit in splenectomized dogs on estimates of total blood volume with P^{32} and T-1824.**

Validity of cell and blood volume measurements in the bled splenectomized dog.

ALLEN, T. H. and REEVE, E. B. **Distribution of 'extra plasma' in the blood of some tissues in the dog as measured with P^{32} and T-1824.**

GREGERSEN, M. I., CIZEK, L. J. and ALLEN, T. H. **Proportion of 'extra plasma' in the eviscerate dog.**

ALLEN, T. H. **Comparison of plasma volumes measured by direct photometry and by extraction of T-1824 in dog and man.**

NICKERSON, J. L., SEAR, H. and REEVE, E. B. **Simultaneous measurements of cell volume with Fe^{55} and P^{32} in splenectomized dogs.**

ROOT, W. S., ALLEN, T. H. and GREGERSEN, M. I. **Simultaneous determinations in splenectomized dogs of cell volume with CO and P^{32} and plasma volume with T-1824.**

ALLEN, T. H., PALLAVICINI, C. and GREGERSEN, M. I. **Simultaneous measurement of plasma volume with hemoglobin and with T-1824.**

SEAR, H., ALLEN, T. H. and GREGERSEN, M. I. **Simultaneous measurement in dogs of plasma volume with I^{131} human albumin and T-1824 with comparisons of their long term disappearance from the plasma.**

ALLEN, T. H., OCHOA, M. (Jr.), ROTH, R. F. and GREGERSEN, M. I. **Spectral absorption of T-1824 in plasma of various species and recovery of the dye by extraction.** *Amer. J. Physiol.*, 1953, 175, 195-203; 204-210; 211-217; 218-223; 224-226; 227-229; 230-232; 233-235; 236-239; 240-242; 243-246. [Dept. Physiol., Coll. Phys. Surg., Columbia Univ., New York.]

1575

DAVIS, F. E., KENYON, K. and KIRK, J. **A rapid titrimetric method for determining the water content of human blood.** *Science*, 1953, 118,

276-277. [Dept. Pathol., Sch. Med., Univ. S. California.]

The titrimetric method of estimating water with the Karl Fischer reagent either by direct titration or by an electrometric end-point gave results for water in whole blood or plasma within about 1 per cent. of those obtained by oven drying. The estimation takes only 10 min. and requires 1 drop of capillary blood.

From a series of 100 samples from unselected blood donors the average percentage value for water in whole blood was 80.8 for females and 80.4 for males. In a smaller group of 15 samples the average values were 80.5 per cent. for whole blood water, 92.5 per cent. for plasma water and 66 per cent. for cellular water.—W. Godden.

1576

WILKINS, M. H. F. and DE CARVALHO, S. **The violet light microscope. A method for visual estimation of heme in living cells.** *Blood, J. Hematol.*, 1953, 8, 944-946. [Inst. Biophys., Rio de Janeiro.]

1577

O'NEIL, J. B. and SPINKS, J. W. T. **A simple method for determining percent uptake of Ca^{45} in tibiae of chicks.** *Poultry Sci.*, 1953, 32, 877-878. [Dept. Poultry, Univ. Saskatchewan, Saskatoon.]

Triplicate groups of 10 New Hampshire \times Barred Plymouth Rock chicks were given an adequate ration alone or with sufficient added vitamin D in maize oil to supply 9, 15, 19.4 and 25 I.U. per 100 g. feed. At 15 days of age all chicks received an oral dose of 0.5 mg. ^{45}Ca as 0.5 ml. CaCl_2 with an activity of approximately 1 μC . per dose. The left tibia of each bird in the group was removed 48 hr. later, dried and ground and compressed into 2.5 g. briquettes of diameter 3 cm. The activity of these briquettes was estimated by scanning from either side with an end window Geiger counter. The briquettes were then ashed and the Ca was recovered as oxalate, the activity of which was similarly estimated. No difference was found in ^{45}Ca uptake of the bone as measured by these methods, a highly significant correlation of +0.9662 existing between the series of measurements. The variation of the replicates of any estimation was similar for both methods.

The ^{45}Ca uptake of the bone was found in 1½ hr. by the new method reported, compared with 8 hr. for the conventional Ca oxalate technique.

M. J. Head.

1578

HILLEMANN, H. H. and LEE, C. H. **Organic chelating agents for decalcification of bones and teeth.** *Stain Technol.*, 1953, 28, 285-287. [Dept. Zool., Oregon State Coll., Corvallis.]

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The use of Sequestrene or Versene, both of which are disodium ethylenediamine tetra-acetate, for the decalcification of the lower jaws of adult guineapigs gave results at least as good as, if not superior to, those of acid decalcification.

W. Godden.

1579

MAINLAND, D. (with MAINLAND, R. B.) **Evaluation of the skeletal age method of estimating children's development. 1. Systematic errors in the assessment of roentgenograms.** *Pediatrics*, 1953, **12**, 114-129. [Dept. Anat., Dalhousie Univ., N.S.] Spanish summary.

The systematic error in skeletal assessment is defined as the persistent difference between an observer's assessments and those of the same X-ray photographs by an expert. The systematic error of an untrained observer was studied by comparing her assessment of the X-ray photographs of the hand in Macy's *Nutrition and Chemical Growth in Childhood* with the published assessments of the same photographs by experts. The assessments of experts as published in Todd's atlas and that of Greulich and Pyle were also compared. It is concluded that even expert assessment of skeletal maturation has not yet reached a desirable degree of stability.—D. Duncan.

1580

REINER, J. M. **The study of a metabolic turnover rates by means of isotopic tracers. 1. Fundamental relations. 2. Turnover in a simple reaction system.** *Arch. Biochem. Biophys.*, 1953, **46**, 53-79; 80-99. [Dept. Biochem., Coll. Phys. Surg., Columbia Univ., New York.]

1581

LAGIER, R. and DEMOLE, M. **Les difficultés techniques du bilan azoté chez l'homme. L'importance du régime antérieur. [Technical difficulties in ascertaining nitrogen balance in man. Importance of the pre-experimental regimen.]** *Presse méd.*, 1953, **61**, 1399-1401. [Fac. Méd., Geneva.]

The need is stressed for consideration of both physical and psychological details in the selection of subjects and of the duration of balance experiments. The preliminary period should be varied according to the subject's history, but always long enough to allow complete adaptation to the experimental diet and the establishment of a steady state before the experiment proper is begun. Constant clinical supervision is desirable to ensure the absence of "stress" which might affect the N balance.—D. Duncan.

1582

BALZER, E. and WERNER, K. **Eine für die Pankreasfunktionsprüfung geeignete Methode zur** Vol. 24, No. 2

Bestimmung der stärkeverzuckernden Fermente im Duodenalinhalt. [Method of estimating the starch-hydrolysing enzymes of duodenal juice, suitable for testing pancreas function.] *Gastroenterologia*, 1953, **80**, 211-220. [Klin. Med., Univ. Münster.] English and French summaries.

In this method, which is suitable for routine clinical work, the starch-hydrolysing enzymes of the duodenal contents are estimated by digesting a 25 per cent. starch solution at 38° C. with 0.5 ml. of undiluted duodenal juice. The reducing power of the starch-degradation products formed by the hydrolysing enzymes of the juice is measured by estimating the aldehyde groups with hypiodite and expressing the results as glucose. The procedure covers a range from 0 to 1300 mg. glucose. For normal persons the range found was 540 to 900 mg. glucose. Thus the method allows a larger range for decrease of enzyme activity, which is more important diagnostically, than for its increase. The usefulness of the method for testing external pancreatic secretion is illustrated by enzyme curves obtained from fractional estimations on duodenal juice in healthy subjects and in patients with pancreatic disease.—M. B. Richards.

1583

JONES, R. J., HUFFMAN, S. and BALTER, E. L. **An assay technique for evaluating the effect of dietary constituents on hypercholesteremia.** *J. Lab. Clin. Med.*, 1953, **42**, 822-823. *Proc.* [Chicago, Ill.]
A study with cockerels.

1584

CARPENTER, K. J. **The concept of an "appetite quotient" for the interpretation of ad libitum feeding experiments.** *J. Nutrition*, 1953, **51**, 435-440. [Rowett Res. Inst., Bucksburn, Aberdeenshire.]

In order to eliminate the effects of difference in food intakes between groups of animals fed to appetite on different experimental diets a method of mathematical treatment of results is suggested. The "same level of food intake" is interpreted as such that "the rate of intake of metabolizable energy is the same proportion to bodyweight^{0.88}". An example is calculated from the data of an experiment of Laguna and Carpenter (Abst. 4804, Vol. 21), to demonstrate that observed differences in growth between groups of rats on nicotinic-acid-deficient and supplemented diets were not to be explained by differences in appetite.—D. Duncan.

1585

BRAY, D. J., SANFORD, P. E. and CLEGG, R. E. **The value of paired individual comparisons in chick growth experiments.** *Poultry Sci.*, 1953,

32, 1094-1095. [Kansas Agric. Exp. Stat., Manhattan.]

In a feeding trial chicks were fed from one day to 12 days of age on a depletion ration; they were then stratified according to their weight gain over this period with 6 chicks in each stratum. One chick from each stratum was then given each of the 6 experimental treatments: altogether 6 strata were used. Each chick was caged individually, and the experiment continued for 23 days.

Statistical analysis taking into account the variance eliminated by stratification greatly increased the sensitivity of the test for the detection of treatment differences. The same result was obtained in a further trial of similar design, and it is concluded that this experimental technique is of considerable value for work with expensive

rations where it is important to use the minimum number of experimental animals.—K. J. Carpenter.

1586

CHILTON, N. W. and FERTIG, J. W. **The estimation of sample size in experiments. 2. Using comparisons of proportions.** *J. Dent. Res.*, 1953, **32**, 606-612. [Sch. Pub. Health, Fac. Med., Columbia Univ., New York.]

1587

CRICHTON, J. A. **The use of monozygous twins in experiments with cattle.** *Vet. Rec.*, 1953, **65**, 832-834. [Rowett Res. Inst., Bucksburn, Aberdeenshire.]

See also Absts. 1548, 2452, 2505, 2523, 2540.

COOKING, STERILISATION AND PRESERVATION OF FOOD

1588

HÖGL, O. Beimengung fremder Stoffe zu Lebensmitteln. [The addition of foreign substances to foods.] *Gegenwartsp Probleme der Ernährungsforschung, Symposium, Basle*, October 1952, 148-157. Verlag Birkhäuser, Basle, 1953. Price Swiss fr. 32. [Eidg. Gesundheitsamt, Berne.]

1589

LANG, K. Wertverminderung von Eiweiss durch Erhitzen und Konservieren. [Loss of value of protein by heating and preservation.] *Gegenwartsp Probleme der Ernährungsforschung, Symposium, Basle*, October 1952, 102-112 (with discussion 113-115). Verlag Birkhäuser, Basle, 1953. Price Swiss fr. 32. [Physiol. Chem. Inst., Univ. Mainz.]

1590

RENNER, R., CLANDININ, D. R., MORRISON, A. B. and ROBBLEE, A. R. **The effects of processing temperatures on the amino acid content of sunflower seed oil meal.** *Poultry Sci.*, 1953, **32**, 922. *Proc.* [Univ. Alberta, Edmonton.]

1591

JAIN, D. C. and MEHRA, S. L. **A study of the storage behaviour of raw, refined and hydrogenated groundnut oils.** *Ann. Biochem. Exp. Med.*, 1952, **12**, 17-28. [Minist. Food Agric., Food Div., Govt. India, New Delhi.]

Samples of the 3 types of oil from 2 factories were stored in tins or glass containers in the dark at $34^{\circ} \pm 6^{\circ} \text{C.}$ and $50^{\circ} \pm 1^{\circ} \text{C.}$ for periods up to 16 weeks. In all cases the refined oils deteriorated more rapidly than the corresponding raw or hydrogenated oils, as shown by rises in the acid and

peroxide values and by qualitative tests. Deterioration was greater, particularly in the refined oils, at the higher temperature.—W. Godden.

1592

HODGE, J. E. **Dehydrated foods. Chemistry of browning reactions in model systems.** *J. Agric. Food Chem.*, 1953, **1**, 928-943. [N. Reg. Res. Lab., Peoria, Ill.]

A review.

1593

VANDEGAER, J. E. and MIETTINEN, J. K. **A paper photoelectric investigation on milk serum proteins.** *Acta chem. scand.*, 1953, **7**, 1239-1242. [Biochem. Inst., Helsinki.]

Electrophoretic diagrams from normal whey and whey from pasteurised and sterilised milks are compared. Pasteurisation probably causes slight denaturation of immunoglobulins, but sterilisation results in substantial changes.

H. G. Bray.

1594

BHAT, J. V., BROKER, R. and IYER, V. **The role of saffron and nutmeg in indigenous milk preparations.** *Indian J. Dairy Sci.*, 1953, **6**, 121-126. [Dept. Microbiol., St. Xavier's Coll., Bombay.]

The effect of a 1 per cent. solution of saffron (*Crocus sativus*) and a 1 per cent. emulsion of nutmeg (*Myristica fragrans*) on the growth of *Bacillus cereus*, *B. megatherium* and *B. subtilis* was studied. Counts were made after 0, 2, 4, 6 and 8 hr. The results are presented in detail.

Both substances reduced the rate of multiplication of all organisms and when used in the customary manner as flavours for milk and milk products would function as preservatives.

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The effect of the substances on several digestive enzymes was studied. Both stimulated the activity of pepsin and rennin, the enzymes concerned in the breakdown of milk proteins.—P. C. Jowsey.

1595

THIEULIN, G. Travaux et recherches sur le lait et les produits laitiers. [Work and research on milk and milk products.] *Lait*, 1953, **33**, 500–507 (to be continued).

1596

SRINIVASAN, M. R., MANI, G. S. and RAY, S. C. Studies on the production of ghee (clarified butter-fat) directly from cream. 1. Treatment of cream to reduce the serum solids. *Indian J. Dairy Sci.*, 1953, **6**, 127–137. [Indian Dairy Res. Inst., Bangalore.]

1597

MUNRO, P. and BARNICOAT, C. R. The problem of fishiness in butter. *J. Dairy Res.*, 1953, **20**, 274–279. [Dept. Biochem., Massey Agric. Coll., Palmerston North, N.Z.]

1598

EVANS, R. J., DAVIDSON, J. A. and BAUER, D. Losses of certain amino acids during storage of shell eggs. *Poultry Sci.*, 1953, **32**, 898. *Proc.* [Michigan State Coll., East Lansing.]

1599

LEA, C. H. Recent developments in the study of oxidative deterioration of lipids. *Chem. and Indust.*, 1953, No. 49, 1303–1309. [Low Temperature Res. Stat., Univ. Cambridge.]

1600

BOSE, S. M. and SUBRAHMANYAN, V. Mode of development of peroxides and attendant changes in vegetable oils on storage. *Ann. Biochem. Exp. Med.*, 1952, **12**, 111–114. [Div. Biochem. Nutrit., Central Food Technol. Res. Inst., Mysore.]

1601

CLEGG, R. E., WEI, A. C. and MCINTYRE, R. T. Fatty acid oxidation by poultry meat extract. *Poultry Sci.*, 1953, **32**, 893. *Proc.* [Kansas State Coll., Manhattan.]

1602

WHITE, G. D. Weight loss in stored wheat caused by insect feeding. *J. Econ. Entomol.*, 1953, **46**, 609–610. [U.S. Dept. Agric., Agric. Res. Admin., Bur. Entomol.]

Fifteen sub-samples each weighing about 14 g. were taken from a sample of newly harvested

wheat that had been freed from living insects by exposure to a temperature below freezing-point for 5 days.

To each of 10 sub-samples, 20 adult female rice weevils, from 2 to 3 weeks old, were introduced; the remaining 5 sub-samples acted as controls. All were kept at 80° F. and 70 per cent. relative humidity. The weevils were allowed to oviposit for 2 days and were then removed. One week later, and weekly thereafter, all the samples were weighed. Gain or loss in the controls was due to variations in moisture content and the correction was applied to the test samples. Emergence of adult weevils began after 4 weeks and was complete by the end of the fifth week. Weevils were removed daily, as only losses due to developing larvae were being measured.

The mean losses of weight per infested kernel at the end of each of 5 weeks were, in per cent., 0.67, 2.36, 6.52, 13.59 and 20.00. The weight of refuse such as faecal matter, moulted skins, pupal cases and frass left within the kernels was not estimated, so that the actual loss of endosperm was greater than the weight losses indicated. About 68 per cent. of the total loss of weight occurred during the first 4 weeks of development when there was no outward sign of infestation.—P. C. Jowsey.

1603

GREUP, D. H. Schimmelenzymen en hun toepas-singsmogelijkheden bij de broodbakkerij. [Mould enzymes and the possibility of their use in the baking of bread.] *Chem. Weekblad*, 1953, **49**, 657.

Enzymes of the α -amylase type, and others that split dextrin and protein, prepared from cultures of *Aspergillus oryzae*, may greatly improve the quality of bread, the effect depending on the type and enzyme content of the flour used. Hard wheat of low enzyme content shows most improvement.—I. Leitch.

1604

GREUP, D. H. and HINTZER, H. M. R. Die Verwendung von Pilzenzymen bei der Brotherstellung. [Use of enzymes from moulds in breadmaking.] *Brot u. Gebäck*, 1953, **7**, 1–8. [Centraal Inst. Voedingsonderzoek T.N.O., Wageningen.]

1605

JAMALAINEN, E. A. Suomessa viljeltyjen omen-alajikkeiden säilyvyydestä varastossa. [Storage qualities of varieties of apples grown in Finland.] *Maataloust. Aikakausk.*, 1953, **25**, 136–146. [Dept. Plant Pathol., Agric. Res. Centre, Tikkurila.] English summary.

1606

- DEN HARTOG, C. De huishoudelijke bereiding van voedingsmiddelen. [**Household preparation of foods.**] *Voeding*, 1953, **14**, 444-458. [Voorlichtingsbureau, Voedingsraad, The Hague.] English summary.

A review.

1607

- NICHOLAS, J. E., PERRY, J. S., GAREY, J. G., MURPHY, J. F., GUERRANT, N. B., HARTZLER, E. R., DODDS, M. L. and BENNETT, G. **Some factors affecting the quality of frozen foods.** *Pennsylvania Agric. Exp. Stat. Bull.* No. 565, April 1953, pp. 29. [State College, Pa.]

The foods studied were beef, pork, peas and Lima beans obtained during two seasons. They were frozen, in packed or unpacked states, in still air at 0° F. or in air blast at -20° F. and stored at +10°, 0° or -20° F. Details of the preparation of the foods are given.

During refrigeration wide differences were found between packed and unpacked samples for the times taken to pass the second stage, that of maximum crystal formation. Bacteriological examinations showed that the type of food had no effect on the results obtained and that the conditions of storage which showed the highest survival rate for organisms were those which gave products subsequently judged by the organoleptic panels to be of poorest quality. Biochemical studies showed

that free fatty acid and peroxide values in beef were highest in the samples stored at the highest temperature, and that loss of ascorbic acid from the vegetables was greatest at the highest storage temperature. The amount of ascorbic acid lost from the beans was much less than that from peas.

It is concluded that if the quality of meat is to be maintained during storage for 4 to 8 months, the temperature of storage must be 0° F. or below and that, within the range studied, the lowest temperature provided the vegetables of the highest quality.—D. Harvey.

1608

- DEMPSTER, D. G. **Pit silage.** *Dept. Agric. Scotland Advisory Leaflet.* No. 6 (New Ser. Revised). H.M.S.O., Edinburgh, 1953, pp. 8. [N. Scotland Coll. Agric.] Price 1s. net.

Advice on choice of site, size and construction of pits and procedure for making pit silage is given, and the quality and feeding value of the silage are briefly discussed. Suitable crops are mentioned.—T. D. Bell.

1609

- HALICK, J. V. and RICHARDSON, L. R. **Influence of moisture on heating in feeds.** *Texas Agric. Exp. Stat. Bull.* No. 768, August 1953, pp. 14. [Dept. Biochem. Nutrit.]

See also Absts. 1501, 1546, 1641, 1705, 1727, 1736, 1761, 1881, 1884, 1885, 2461.

CULTURE OF MICRO-ORGANISMS FOR FOOD

1610

- BASACA, M. G. **Production of yeast from molasses.** *Philippine J. Sci.*, 1952, **81**, 75-79. [Div. Biol. Res., Inst. Sci. Technol., Manila.]

Torulopsis utilis was cultivated in molasses with addition of trisodium phosphate and ammonium sulphate. The exact method is described. The average yield from 32 tests was 285 g. ground dry

yeast from 150 g. sugars of the wort. The material contained, per cent., moisture 7.5, protein 48.2, glycogen 12.5, fat 4.33 and ash 6.2. It is considered that the speed and low cost of production and the high nutritive value make it desirable that a pilot plant should be set up in the Philippines.

E. M. Hume.

2. CHEMICAL COMPOSITION OF FOODSTUFFS

(Except Vitamins, for which see Section 3)

ENERGY VALUE, PROXIMATE PRINCIPLES AND INORGANIC CONSTITUENTS

GENERAL

1611

- HADORN, H. Vergleichende Untersuchungen an diätetischen Nahrungsmitteln. [**Comparative studies of commercial food preparations.**] *Mitt. Geb. Lebensmittel. Hyg.*, 1953, **44**, 348-363. [Lab. VSK, Basle.] French and English summaries.

Report of a subcommittee of the *Eidg. Lebensmitelbuch-Kommission*. With methods previously published (Absts. 4563, Vol. 19: 120, Vol. 21) or slight modifications described here, good agreement was found when a known mixture of dried milk, cocoa, sugar, malt extract and dried egg, a commercial breakfast beverage, and an infant food with cocoa added were analysed in 5 laboratories,

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except for butyric acid number and lecithin phosphate. For the former the source of discrepancy was found. The estimation of lecithin phosphate is regarded as not altogether reliable.

W. M. Deans.

1612

MAYNARD, L. A. **Total digestible nutrients as a measure of feed energy.** *J. Nutrition*, 1953, **51**, 15-21. [Cornell Univ., Ithaca, N.Y.]

A review.

1613

BIGWOOD, E. J. **Free and combined amino-acids in foodstuffs.** *Gegenwartsp Probleme der Ernährungsforschung, Symposium, Basle*, October 1952, 88-99 (with discussion 100-101). Verlag Birkhäuser, Basle, 1953. Price Swiss fr. 32. [Dept. Biochem. Nutrit., Fac. Med., Univ. Brussels.]

1614

WESTERFELD, W. W. and RICHERT, D. A. **Distribution of the xanthine oxidase factor (molybdenum) in foods.** *J. Nutrition*, 1953, **51**, 85-95. [Dept. Biochem., Med. Coll. State Univ. New York, Syracuse.]

Available molybdenum was estimated in a number of foodstuffs by the method of Richert and Westerfeld (Abst. 4941, Vol. 21). When the results were compared with those for Mo estimated chemically it was found that from 50 to 100 per cent. of the total Mo in the foodstuffs was available. Legumes, cereal grains, some dark green leafy vegetables and liver, kidney and spleen were good sources of Mo as xanthine oxidase factor. Fruits, berries and most root and stem vegetables were relatively poor sources.—W. Godden.

1615

CREMER, H. D. Mineralien als Nahrungsbestandteile. [**Minerals as components of foods.**] *Gegenwartsp Probleme der Ernährungsforschung, Symposium, Basle*, October 1952, 239-258 (with discussion 259-260), Verlag Birkhäuser, Basle, 1953. Price Swiss fr. 32. [Physiol. Chem. Inst., Univ. Mainz.]

See also Abst. 1555.

FOODSTUFFS OF ANIMAL ORIGIN

Milk and Milk Products

1616

CHEUNG, M. W., PRATT, E. L. and FOWLER, D. I. **Total amino acid composition in mature human milk; analysis by the ion exchange resin column chromatographic technic.** *Pediatrics*, 1953, **12**, 353-357. [Dept. Paediat., Coll. Med., New York.] Spanish summary.

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Eighteen amino-acids were estimated by the method of Moore and Stein (Abst. 4469, Vol. 21) in the hydrolysates from 2 pooled samples of human milk, from 9 and 5 mothers, respectively. 3-Methylhistidine and 2 unidentified ninhydrin-reactive substances were also present in the milks in significant amounts.—W. Godden.

1617

HOOVER, J. R. E., BRAUN, G. A. and GYÖRGY, P. **Neuraminic acid in mucopolysaccharides of human milk.** *Arch. Biochem. Biophys.*, 1953, **47**, 216-217. [Wyeth Inst. Appl. Biochem., Sch. Med., Univ. Pennsylvania, Philadelphia.]

A further study of the growth factors in human milk essential for *Lactobacillus acidophilus* (*Amer. J. Dis. Child.*, 1952, **84**, 482) resulted in the preparation of non-dialysable fractions, active for *L. bifidus*, from samples of human milk. From one sample a material was obtained apparently identical with the neuraminic acid reported by Klenk and Lauenstein (*Hoppe-Seyler's Ztschr.*, 1952, **291**, 147).—W. Godden.

1618

MOCQUOT, G. Orientation des recherches sur le lait en France. [**Orientation of research on milk in France.**] *Lait*, 1953, **33**, 508-514.

1619

SHIPE, W. F., DAHLBERG, A. C. and HERRINGTON, B. L. **Variations in the freezing points of cow's milk.** *J. Dairy Sci.*, 1953, **36**, 924-933. [Dept. Dairy Indust., Cornell Univ., Ithaca, N.Y.]

1620

EL-SOKKARY, A. M. and HASSAN, H. A. **Calculation of the solids-not-fat contents of cow and buffalo milk.** *Indian J. Dairy Sci.*, 1953, **6**, 93-95. [Fac. Agric., Ibrahim Pasha Univ., Shebin El-Kome, Egypt.]

Total solids, fat and sp. gr. were estimated for morning or evening individual samples of milk from 100 cows and 100 buffaloes taken at random. Total solids and hence solids-not-fat were calculated also from Richmond's formulae. The difference between mean estimated and calculated values for solids-not-fat was not significant for cows but was just significant for buffaloes. It is considered that with bulk milk samples the differences would be insignificant.—W. Godden.

1621

ZELTER, Z. Travaux biochimiques et biophysiques récents sur la structure et la constitution des caséines. [**Recent biochemical and biophysical work on the structure and constitution of caseins.**] *Lait*, 1953, **33**, 481-494.

1622

FREIMUTH, U. Studien über die Eiweisskörper des Milchserums. 2. Koagulation durch Erhitzen. [The proteins of whey. 2. Coagulation by heat.] *Biochem. Ztschr.*, 1953, **324**, 504-511. [Inst. Tierzuchtforsch., Deutsch. Akad. Landwirtschaft., Berlin.]

For part 1 see Abst. 1463, Vol. 24.

Albumin and globulin were salted out from milk serum with Na_2SO_4 and were separately coagulated by heat in acetate buffer solutions of different concentration and pH. There was no characteristic difference in the behaviour of proteins from cow, ewe and goat milks. Neither protein showed complete coagulation; in both the maximum was attained at pH 4.5. The curve for albumin was symmetrical about this point, but that for globulin remained horizontal from pH 4.5 to the neutral point. The curves were not affected by changes in the molar concentration of the buffer solutions. The proteose fraction, not coagulable by heat, depended on the pH and also on the protein concentration, owing probably to dissociation of the protein molecule by denaturation and splitting of the peptide chain.—W. Godden.

1623

PATTON, S. The presence of hippuric acid in milk. *J. Dairy Sci.*, 1953, **36**, 943-947. [Dept. Dairy Husb., Pennsylvania Agric. Exp. Stat., State College.]

Hippuric acid was estimated in skimmed milk by digestion of the milk with trypsin, acidification with H_2SO_4 and continuous extraction with ethyl ether. The N estimated in the extract by the Kjeldahl method was a measure of the hippuric acid in the skimmed milk. The values for 14 samples analysed over a period of 6 months were 3.1 to 6.4, average 5.1 mg. per 100 ml., values considerably higher than those previously reported by Karabinos and Dittmer (Abst. 1949, Vol. 13). W. Godden.

1624

MORTON, R. K. Alkaline phosphatase of milk. 1. Association of the enzyme with a particulate lipoprotein complex. 2. Purification of the enzyme. *Biochem. J.*, 1953, **55**, 786-795; 795-800. [Dept. Biochem., Univ. Cambridge.]

1. Alkaline phosphatase, which is low in milk, is largely adsorbed on the fat globules, from which it can be released into the aqueous phase by churning the cream. The butterfat is devoid of activity. The enzyme is present in fat-free separated milk as a particulate lipoprotein complex and can be sedimented along with a portion of the casein by high-speed centrifuging. The lipoprotein particles are also precipitated along with casein by acids, salts or organic solvents, but the use of rennin or pepsin permits of some separation. The

lipoprotein complex which binds the milk alkaline phosphatase may be disrupted by treatment of the aqueous material, i.e., milk or its products, with *n*- or isobutanol. This removes the lipid and leaves the enzyme in true solution.

2. With butanol to disrupt the lipoprotein complex, by centrifuging the solution, the alkaline phosphatase was purified to an activity 5600 times that in the initial whole milk, the final product having an activity of 15,300 units per mg. N. A unit is defined as the amount of enzyme which liberates 1 μg . inorganic P per min. from sodium β -glycerophosphate at 38° C. Electrophoretic studies indicated that the purified enzyme was probably homogeneous. In the course of the purification a red protein fraction was separated from buttermilk, but its identity was not established.—W. Godden.

1625

DAVIDOV, R. and ANISIMOVA, V. Soderzhanie ioda v moloche. [Iodine content of milk.] *Mol. Prom.*, 1953, **14**, No. 8, 33-35. [Sel.-Khoz. Akad. Im. Timiryazeva, Moscow.]

The I content of milk was estimated at different periods of lactation. Taking the average I content of the colostrum as 100 per cent., the I content of the milk during the main period of lactation was 40 and at the end of lactation 21 per cent. The I content in winter was $1\frac{1}{2}$ times that in summer. Milk that had been pasteurised, cooled and stored contained 22 per cent. less I than raw milk.

E. W. Birse.

1626

BRUNNER, J. R., DUNCAN, C. W. and TROUT, G. M. The fat-globule membrane of non-homogenized and homogenized milk. 1. The isolation and amino acid composition of the fat-membrane proteins.

BRUNNER, J. R., LILLEVIK, H. A., TROUT, G. M. and DUNCAN, C. W. 2. Differences in the electrophoretic patterns of the fat-membrane proteins.

BRUNNER, J. R., DUNCAN, C. W., TROUT, G. M. and MACKENZIE, M. 3. Differences in the sedimentation diagrams of the fat-membrane proteins. *Food Res.*, 1953, **18**, 454-462; 463-468; 469-474. [Dept. Dairy and Agric. Chem., Michigan Agric. Exp. Stat., East Lansing.]

1. The proteins of the fat globule membrane of homogenised and non-homogenised milk were isolated from the separated cream by removing the fat as butter, concentrating the serum, dialysing, treating the non-dialysable material with ethanol and ethyl ether, dispersing the residue in water and lyophilising. Thirteen amino-acids and N were estimated in the resulting preparations. The membrane proteins from the homogenised

milk had higher concentrations of glutamic acid and lysine and lower concentrations of cystine, glycine and tryptophan than had the membrane proteins from non-homogenised milk. The results indicated that the main protein constituents of the milk plasma form a large percentage of the membrane protein complex in homogenised milk.

2. Ascending and descending mobility patterns were obtained for the fat membrane proteins from the two types of milk in different buffer systems from pH 1.5 to 10.8. The number of components differed in the two types of membrane protein. The components were not identified, but the results support the view that the membrane proteins from homogenised milk contain adsorbed milk plasma proteins.

3. The ultracentrifugal sedimentation velocity diagrams of the two types of fat membrane proteins support the above findings.—W. Godden.

1627

CONOCHIE, J. **Indole and skatole in the milk of the ruminant feeding on *Lepidium* spp.** *Austral. J. Exp. Biol. Med. Sci.*, 1953, **31**, 373-384. [Dairy Res. Sect., C.S.I.R.O., Melbourne.]

The high indole content of butterfat from cows feeding on *Lepidium virginicum* was reported by Hussong and Quam (Abst. 1768, Vol. 13). At times *Lepidium hyssopifolium* provides the greater part of the herbage available to dairy stock in southern Queensland. It was shown that under such conditions the taint in milk is due to the presence of indole and skatole, although the plant contains no abnormal amount of any known precursor of indole. Strained rumen contents from sheep were incubated alone or with *Lepidium*. No difference in indole production was observed. The feeding of antibiotics eliminated *Bacterium coli* from the faeces and reduced but did not prevent the abnormal concentrations of indole and skatole in the milk. In experiments with goats given *Lepidium* there was no significant increase in the daily urinary indican excretion or in the indole output in faeces, but when hourly collections of urine were taken there was evidence of a temporary interference with the detoxification of indole which could account for the high indole level in the milk. When the animals were changed from an alfalfa to a *Lepidium* diet indole in the blood rose from zero to 1.0 p.p.m. and such a high level at the time of milking caused a high concentration in the milk fat. The results did not indicate any practicable means of reducing the incidence of *Lepidium* taint in milk (cf. Conochie, *Austral. J. Dairy Technol.*, 1950, **5**, 43.)

W. Godden.

1628

STULL, J. W. **The effect of light on activated flavor development and on the constituents of**

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milk and its products : a review. *J. Dairy Sci.*, 1953, **36**, 1153-1164. [Dept. Dairy Husb., Univ. Arizona, Tucson.]

1629

HANSEN, R. P. and SHORLAND, F. B. **The branched-chain fatty acids of butterfat. 3. Further investigations on a multibranched C₂₀ saturated fatty acid fraction.** *Biochem. J.*, 1953, **55**, 662-663. [Fats Res. Lab., D.S.I.R., Wellington, N.Z.]

With the combined techniques of fractional distillation *in vacuo*, chromatography on activated alumina and low-temperature crystallisation, a multi-branched C₂₀ saturated fatty acid fraction was isolated from 36.7 kg. of New Zealand butterfat. The amount, 0.006 per cent. of the butterfat, probably represented only a part of the total.

In a previous paper (Abst. 231, Vol. 22) the isolation of a similar fraction from butterfat was reported, but in this earlier work one of the isolation techniques involved hydrogenation; the present work established that the C₂₀ acid fraction exists naturally, in part or in whole, as a saturated constituent.—G. A. Garton.

1630

CORNWELL, D. G., BACKDERF, R., WILSON, C. L. and BROWN, J. B. **The trans-octadecenoic acid content of butterfat.** *Arch. Biochem. Biophys.*, 1953, **46**, 364-375. [Inst. Nutrit. Food Technol., Columbus, Ohio.]

Methyl esters of the fatty acids of 3 samples of summer butterfat from Jersey cows and from 1 sample of winter butterfat from a mixed herd were prepared. The mixed esters were distilled *in vacuo* to yield concentrates of the C₁₈ esters, which were further concentrated by low-temperature crystallisation, from appropriate solvents, of the esters or the free acids. The fractions were examined for the presence of *trans* fatty acids by infrared absorption analysis.

The 3 summer butterfats contained from 9.5 to 9.7 per cent. of *trans* fatty acids, mainly *trans*-octadecenoic and -octadecadienoic acids; traces of other *trans*polyethenoid acids may have been present. The winter butterfat contained 5 per cent. of *trans* acids. Of the "oleic" acid of summer butterfat, 14 to 20 per cent. was identified as *trans* isomers, one component of which was probably vaccenic acid. *Trans*-octadecadienoic acids accounted for 6 to 8 per cent. of the total fatty acids of summer and 3.5 per cent. of those of winter butterfat.—G. A. Garton.

1631

GUHA, MRITYURYOY, PROSAD, GUHA, MANISHI, PROSAD and RAMNARAIN, S. **Studies on the quality of ghee available in the wholesale and**

retail markets of Calcutta. *Indian J. Vet. Sci.*, 1953, **23**, 59-72. [Chem. Lab., Presidency Coll., Calcutta.]

1632

LALITHA, K. R. and DASTUR, N. N. **Keeping quality of ghee. 1. Effect of nature of milk, method of preparation, temperature of melting and antioxidants on the keeping quality.** *Indian J. Dairy Sci.*, 1953, **6**, 147-168. [Indian Dairy Res. Inst., Bangalore.]

Samples of ghee prepared from cow and buffalo milk under different conditions by the desi and creamery methods were stored for up to 184 days and sampled at intervals. The results are given in detail.

Butterfat prepared at 40°, 65° and 115° C. kept well provided that moisture and impurities were removed. Peroxides developed more slowly in the 40° C. sample than in the others. An off-flavour became perceptible at a peroxide value of about 1.0 and was pronounced at a value of 1.5. Ghee made by the desi method developed peroxides faster than creamery ghee.

Small amounts of free fatty acids, up to 1.5 per cent. oleic acid, did not affect keeping quality. High-acid ghee spoiled rapidly. Ethyl gallate added at a concentration of 0.02 per cent. checked oxidative spoilage but had no effect on the development of free fatty acids.—P. C. Jowsey.

1633

ROGICK, F. A. Estudo sobre os leites fermentados consumidos na Capital. [**Fermented milks consumed in the capital (São Paulo).**] *Bol. Indúst. animal, São Paulo*, 1952, **13**, 135-140. [Div. Indust. Prod. Animal.] English summary.

1634

CARTER, R. H., HUBANKS, P. E., POOS, F. W., MOORE, L. A. and ELY, R. E. **The toxaphene and chlordane content of milk from cows receiving these materials in their feed.** *J. Dairy Sci.*, 1953, **36**, 1172-1177. [Bur. Entomol. Plant Quarantine, U.S. Dept. Agric., Washington, D.C.]

See also Abst. 1540.

Eggs

1635

EVANS, R. J. and DAVIDSON, J. A. **The protein content of fresh and stored shell eggs.** *Poultry Sci.*, 1953, **32**, 1088-1089. [Dept. Agric. Chem., Michigan State Coll., East Lansing.]

Three lots each of 64 eggs from Single Comb White Leghorn hens were used. One lot was examined as soon as possible after laying and the

others after storage at 0° C. for 9 and 18 months. N was estimated in yolk and whites separately.

The following protein (N × 6.25) contents were found in fresh, 9-month-old and 18-month-old eggs, respectively: white 3.11, 3.24, 2.92; yolk 2.79, 2.74, 2.91 mg. per egg. The loss of protein over 18 months was considered to be insignificant.

A loss of 13.9 per cent. after 18 months' storage reported previously (Abst. 225, Vol. 19) is now thought to have been due to differences in the protein contents of the initial samples.

P. C. Jowsey.

See also Abst. 2625.

Meat (All Kinds)

1636

ALEXANDER, J. C., BECKNER, C. W. and ELVEHJEM, C. A. **The alanine, cystine, glycine and serine content of meat.** *J. Nutrition*, 1953, **51**, 319-328. [Dept. Biochem., Coll. Agric., Univ. Wisconsin, Madison.]

The meat samples were the same as those used by Violante *et al.* (Abst. 192, Vol. 23). The amino-acids were estimated microbiologically. Results are given in detail.

Average values for all samples were: cystine 1.1, glycine 5.0, serine 5.2, alanine 6.4 g. per 100 g. protein calculated to 16 per cent. N.

Tween 80 at a level of 0.005 per cent. by volume was added to all assay media. It had the effect of eliminating a lag from the alanine standard curve and reduced blank titration values, removed the depression of growth for *Leuconostoc mesenteroides* at higher levels of cystine, eliminated drifts with *Lactobacillus casei* in serine assays and increased the recovery of serine with *Lactobacillus delbrueckii* from 94 to 98 per cent. It also produced a general stabilising effect in all assays, resulting in less variation and greater reproducibility of results.

P. C. Jowsey.

Fish

1637

BUSSON, F., POSTEL, E. and GIRAUD, P. Valeur alimentaire des poissons pêchés sur les côtes de la Presqu'île du Cap-Vert. [**Nutritive value of the fish caught off the coasts of the Cape Verde Peninsula.**] *Méd. trop.*, 1953, **13**, 534-537. [Organisme d'Enquête Étude Anthropol. Indigènes A.O.F. Alimentation Nutrition.]

Standard methods of the Association of Official Agricultural Chemists were used to estimate the fat, ash, water, protein, Ca and P contents, and the energy value of fishes and shellfish commonly caught off the Cape Verde Peninsula. Tunny and crab had the highest protein contents, 22.5 and 21 per cent., respectively. Mackerel was high in both protein and fat. Data for 14 species are tabulated.

A. M. Copping.

N.A. and R., April 1954

1638

SAHA, K. C. and CHOWDHURY, N. K. **Nutritional investigations on the sun-dried fish of West Bengal.** *Ann. Biochem. Exp. Med.*, 1951, **11**, 193-196. [Technol. Lab., Directorate Fish., Govt. W. Bengal.]

Samples of sun-dried fish from a new government curing factory were compared with samples bought from local curers who use primitive traditional methods. The factory samples had consistently higher protein and much lower ash contents. About 75 per cent. of the ash in locally cured samples was sand, some picked up during the drying process and some deliberately added to increase the weight. The local samples carried a greater number of bacteria than the factory samples.—P. C. Jowsey.

1639

JACQUOT, R. and CREAC'H, P. V. Les protides du poisson et leur valeur alimentaire. [**Fish proteins and their nutritive value.**] *Congr. internat. Étude Role du Poisson dans l'Alimentation*, 1950, 11-58. [Lab. Biochim. Nutrit., C.N.R.S.]

1640

CONNELL, J. J. **Studies on the proteins of fish skeletal muscle. 2. Electrophoretic analysis of low ionic strength extracts of several species of fish.** *Biochem. J.*, 1953, **55**, 378-388. [D.S.I.R., Torry Res. Stat., Aberdeen.]

With the technique previously reported (Title 4041, Vol. 23), muscle extracts of 20 species of fish were examined electrophoretically at 0.05 I, pH 7.5. Each species had a characteristic electrophoretic diagram and there were considerable differences between them in mobility and composition. The diagrams of related species appeared to be as dissimilar as those of unrelated species. The diagrams could, however, be divided into 3 definite mobility groups. Elasmobranch muscle appeared to contain proteins with unusually high isoelectric points. The effect of age and of species variants on the diagrams was examined.

W. Godden.

1641

SAHA, K. C., SEN, D. P. and SEN, H. K. **Studies on the keeping quality of fish meal used as poultry food.** *Ann. Biochem. Exp. Med.*, 1951, **11**, 197-202. [Technol. Lab., Directorate Fish., Govt. W. Bengal.]

Fishmeal prepared from mixed waste fish was stored for about 6 months at room temperature and humidity in gunny sacks holding 20 lb. or in stoppered glass jars holding 10 lb. Samples were taken every 15 days and moisture, N and protein were estimated and bacterial count was recorded. Fortnightly averages of temperature and humidity

were ascertained also. The results are given in detail.

The meal stored in sacks deteriorated most rapidly. The moisture content rose steadily over the first 10 weeks from about 8 to 18 per cent. and the condition of the meal became favourable to the growth of bacteria, fungi and insects. The bacterial count, though fluctuating, showed a general increase from approximately 30,000 to nearly 60,000 per g. over 10 weeks and remained generally high for the rest of the test. Protein decreased from 39.4 to 27.0 per cent. on a dry matter basis over 6 months.

The moisture content of the meal stored in jars also increased, but more slowly. From an initial value of 8.4 it rose to 13.6 per cent. over 6 months. Over the same period protein fell from 42.7 to 36.9 per cent. The bacterial count fluctuated violently but at the end of 6 months was approximately the same as at the start.

For about 8 weeks the physical characteristics of both sets of samples were similar, but thereafter the meal in sacks deteriorated in texture and developed an unpleasant smell. No such change occurred in the meal stored in glass.

P. C. Jowsey.

1642

LOVERN, J. A. and OLLEY, J. **The lipids of fish. 4. The lipids extracted by an ethanol : ether mixture from haddock flesh previously extracted with acetone.** *Biochem. J.*, 1953, **55**, 686-696. [D.S.I.R., Torry Res. Stat., Aberdeen.]

The lipid fraction examined was that referred to in the first of this series of papers (Abst. 4042, Vol. 23). The crude ethanol : ether extract was completely soluble in light petroleum, but nevertheless it contained more than 50 per cent. of non-lipid impurities which were largely removed by the method of Folch *et al.* (*J. Biol. Chem.*, 1951, **191**, 833). The purified lipid was separated by counter-current distribution between light petroleum and 85 per cent. ethanol into lecithin, phosphatidylethanolamine, plasmalogens, waxes, hydrocarbons and inositol lipids, and some unidentified material.—G. A. Garton.

Other Types

1643

DUCHÂTEAU, G., FLORKIN, M. and THWIN, N. **Acides aminés non protéiniques d'un échantillon de "ngapi seinsa". [Non-protein amino acids in a sample of "ngapi seinsa".]** *Bull. Soc. Chim. biol.*, 1953, **35**, 1149-1151. [Lab. Biochim., Univ. Liège.]

"Ngapi seinsa" is a paste made in Burma from sun-dried, ground, salted shrimps. The paste is compressed into jars and covered with salt. After

6 months, during which time liquid is poured off and renewed from time to time, the paste is ready for use in cooking. A sample contained 270 g. NaCl and 25.5 g. dialysable N per kg. Of this dialysable N, 73.2 per cent. was accounted for as 15 amino-acids.—W. Godden.

FOODSTUFFS OF VEGETABLE ORIGIN

General

1644

CAMARA-BESA, S. F. and BATACLAN, M. **The sodium and potassium content of Philippine foods. 1. Foods of plant origin.** *Acta med. philip.*, 1952, 9, 1-30. [Dept. Physiol. Biochem., Coll. Med., Univ. Philippines.]

Details are given of methods of sampling and preparation of common fruits, vegetables and processed vegetable products for analysis by flame photometry. The Na and K contents of 218 different foods are listed with the native, English and scientific names of the plants of origin. A second table gives the Na and K contents of water samples from local supplies to assist dietitians in making up diets of low Na content. The foods examined had low Na contents, mostly below 10 mg. per 100 g. edible portion. The K contents were generally high and exceeded 1 per cent. in some samples.

The values are of the same order of magnitude as those reported from the United States for similar foods.—A. M. Copping.

1645

NOONAN, J. B. **Molybdenum deficiency in maize and other crops in the Taree district.** *Agric. Gaz. N.S.W.*, 64, 422-424.

1646

MCLACHLAN, K. D. **Phosphorus, sulphur and molybdenum deficiencies on some soils of the Northern Territory.** *J. Austral. Inst. Agric. Sci.*, 1953, 19, 197-199. [Div. Plant Indust., C.S.I.R.O., Canberra.]

Subterranean clover plants grown in pots in grey, red, limestone or granitic soil were treated with P, S and Mo fertilisers in all combinations in an experiment of randomised block design. Significant yield responses to P were obtained on all 4 soils. Response to S was significant on all soils except granitic and significant responses to Mo were obtained on red and granitic soils. The grey, red and limestone soils were more severely deficient in P than eastern Australian soils formed on similar parental material. The S and Mo deficiencies were of the same order as those found in soils of eastern Australia.—F. C. Aitken.

1647

MINKH, A. A. **Ftor v pishchevykh produktakh. [Fluorine in food.]** *Stomatologiya*, 1953, No. 2, 5-8. [Kaf. Gigieny, Med. Stomatol. Inst., Moscow.]

F was estimated in cereals and vegetables grown in different parts of the U.S.S.R. The F content of cereals such as rye, wheat, barley and buckwheat lay within the limits of 0.14 to 0.36 mg. per cent. No great difference was detected between the F contents of the same cereal from different areas. Fairly large variations were found in the F contents of different samples of buckwheat and oats grown in the same area. The F content of vegetables such as beet, cabbage, potatoes, carrots and turnips ranged from 0.02 to 0.95 mg. per cent. Using Gabovich's results for products of animal origin it was estimated that a man probably ingests up to 1 mg. F daily in food.—W. Hughes.

1648

BRANDT, E., PINDBORG, E., FREDSTED, I. and HOFF-JØRGENSEN, E. **Undersøgelser af oxalsyreindholdet i levnedsmidler. [Oxalic acid in foods.]** *Staten Husholdningsråds Faglige Meddelelser*, 1953, No. 4, 19-26.

The toxic effects of oxalic acid caused by the precipitation of Ca in the intestine or within the body are discussed. Data are presented for oxalic acid, estimated by titration with ceric sulphate after extraction with HCl and then ether, in 27 varieties of summer spinach and 25 varieties of spring spinach, for Ca in 8 varieties, for oxalic acid in large- and small-leaved plants of the same kind, and for the loss of oxalic acid when spinach is boiled in small and large amounts of water. On the average of all varieties and places in 1951 and 1952 oxalic acid varied between 665 and 822 mg. per 100 g. fresh weight and none was outstandingly low. Small-leaved plants had less than large-leaved, small-leaved Juliane least with 460 mg. Five per cent. more was lost in boiling with much water than with little.

Oxalic acid in the stalks of all varieties of rhubarb varied from 210, 150 and 100 mg. in the bottom, middle and top third of thin stalks of the variety Linnæus to 890, 620 and 470 mg. in the variety Elmsfeuer. The latter was judged the best rhubarb on taste and colour. Rejection of the bottom third of any variety would greatly reduce the total oxalic acid.

Oxalic acid in teas varied from 970 to 1280 mg. per 100 g. but 100 ml. boiled water had, on the average, enough Ca to fix the oxalic acid in 1 g. tea. Cocoa contained about 500 mg. which, in the quantities used in cocoa made with milk, was also negligible. Other values given are, in mg. per 100 g.: elderberries 12 and 15, beet 710 and 800;

parsley 165 and 170 ; dill 140 and 150 ; tomato 0, 0 and 5 in 3 samples.

If, for instance, rhubarb of the Elmsfeuer-type is to be used, the addition of 2 dessertspoonfuls of a 40 per cent. solution of calcium chloride is recommended, or 1 dessertspoonful for the varieties with less oxalic acid.—I. Leitch.

1649

NYE, P. H. **A survey of the value of fertilizers to the food-farming areas of the Gold Coast. 1. Aims and methods of the survey.** *Empire J. Exp. Agric.*, 1953, **21**, 176-183. [Dept. Soil Sci., Univ. Coll., Ibadan.]

Twelve areas totalling 10,245 sq. miles and comprising about 1/9 of the total area of the Gold Coast were surveyed. Trial crops included early and late millet, guinea corn, groundnuts, maize, rice and yams. In each of the 12 areas, 30 sites were selected at random for each crop under trial and at each site a single replication of a 3 × 3 design was laid down with all combinations of the following treatments: sulphate of ammonia 0, 60 or 120 lb. per acre ; superphosphate (18.5 per cent. water-soluble P_2O_5) 0.60 or 120 lb. per acre. Groundnuts trials comprised 3 plots only and no N fertiliser was applied.

Results will be reported in subsequent papers.

P. C. Jowsey.

Cereals

1650

HALVERSON, A. W. and OLSON, O. E. **The protein composition of barley grown in South Dakota.** *S. Dakota Agric. Exp. Stat. Tech. Bull.* No. 13, January 1953, pp. 18.

The barley varieties Feebar, Odessa and Plains were grown on adjacent plots at 5 stations during 1950 and 1951.

In the first year Feebar and Odessa samples were ground in a Wiley mill, a hammer mill and a ball mill to estimate the effect of fineness of grinding on protein fractionation data. The methods are described. The hammer-milled samples gave the most complete separation of fractions and the most consistent results.

The N content of the barley samples ranged from 1.75 to 3.10 per cent. of the dry matter (protein from 10.9 to 19.4 per cent.). Salt-soluble N, hordein N and glutelin N were estimated and the results are presented in detail. In all 3 varieties glutelin N and hordein N increased as the total protein increased ; salt-soluble N remained almost constant. Expressed as a percentage of total N, glutelin N remained fairly constant, hordein N increased and salt-soluble N decreased as total protein increased.

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It was concluded that the protein composition of barley can be forecast with reasonable accuracy if the total protein content is known.—P. C. Jowsey.

1651

HINTON, J. J. C. **The distribution of protein in the maize kernel in comparison with that in wheat.** *Cereal Chem.*, 1953, **30**, 441-445. [Res. Assoc. British Flour-Millers, St. Albans.]

Kernels of the flinty maize variety Sibthorpe were dissected by hand, and protein ($N \times 6.25$) was estimated in the pooled fractions from several kernels. The protein contents calculated on a 14 per cent. moisture basis were, as a percentage of each fraction: pericarp 3.0, aleurone layer 19.2, endosperm 1 (outer layers) 27.7, endosperm 2 (flinty portion) 7.5, endosperm 3 (inner, floury portion) 5.6, embryo 26.5, scutellum 1.5. As percentages of the whole kernel the figures, in the same order, were: 0.2, 0.4, 1.1, 4.4, 1.0, 0.3, 1.7.

Figures for wheat obtained previously (Abst. 3219, Vol. 17) are reproduced for comparison.

In both maize and wheat, about 70 per cent. of the total protein was found in the endosperm, and there was a decreasing concentration gradient from the outer to the inner portions of this fraction.

P. C. Jowsey.

1652

SAUBERLICH, H. E., CHANG, W. Y. and SALMON, W. D. **The amino acid and protein content of corn as related to variety and nitrogen fertilization.** *J. Nutrition*, 1953, **51**, 241-250. [Dept. Animal Husb., Agric. Exp. Stat., Alabama Polytech. Inst., Auburn.]

Nine samples (6 varieties) of maize were taken from plots which had received 24 lb. N per acre and 10 samples (10 varieties) from plots which had had 84 lb. N per acre. Protein and 18 amino-acids were estimated, the latter microbiologically.

Protein ranged from 6.8 to 8.2 per cent. in the samples from low-N plots and from 9.3 to 12.0 per cent. for those from high-N plots. The amounts of all amino-acids increased with increasing protein but the rates of increase of individual amino-acids differed considerably. N treatment increased the protein and amino-acid contents significantly and the increase was largely in the zein fraction. There was a greater proportion of zein in high- than in low-protein samples.

Other proteins increased also as indicated by an increase in tryptophan and lysine, but not in proportion to the increase in zein. It was concluded that the protein of high-protein maize was inferior to that of low-protein maize from the point of view of non-ruminant nutrition ; this should be borne in mind in the development of new maize varieties.—P. C. Jowsey.

1653

DUSTIN, J. P., SCHRAM, E., MOORE, S. and BIGWOOD, E. J. Dosage chromatographique des acides aminés d'une graine de céréale (orge), d'un foin, et d'un tourteau de lin. [Chromatographic estimation of amino-acids in a cereal grain (barley), hay and linseed cake.] *Bull. Soc. Chim. biol.*, 1953, **35**, 1137-1147. [Lab. Biochim., Fac. Méd., Univ. Brussels.]

With the chromatographic technique previously described (see Abst. 44, Vol. 24), most of the amino-acids in the 3 feedingstuffs were estimated. Cystine, which was completely destroyed during the hydrolysis, was estimated separately by the method of Schram and Moore (in the press). Methionine was estimated as its sulphoxide and tryptophan microbiologically in an alkaline hydrolysate. The amino-acids accounted for 87.5, 78.5 and 93.9 per cent. of the total N in barley, hay and linseed cake, respectively; of the total S in barley, 84 per cent. was present as cystine and methionine; in the hay only 21 per cent. was recovered in these forms and in the linseed cake 72 per cent.—W. Godden.

1654

YEMM, E. W. and FOLKES, B. F. The amino acids of cytoplasmic and chloroplastic proteins of barley. *Biochem. J.*, 1953, **55**, 700-707. [Dept. Botany, Univ. Bristol.]

Eighteen amino-acids were estimated, most of them microbiologically, in cytoplasmic proteins from mature barley leaves and in mixed cytoplasmic and chloroplastic proteins from mature barley leaves and barley seedlings.

The contents were similar in all cases, except for lysine, which showed some slight variation.

P. C. Jowsey.

1655

GARDNER, H. W. Nitrogen top dressing of spring oats. *Agriculture, J. Minist. Agric. Engl.*, 1953, **60**, 328-334. [Hertfordshire Inst. Agric., St. Albans.]

A top-dressing of 2 cwt. Nitro-chalk per acre applied in May increased the yields of grain and straw by 1.26 and 2.0 cwt. per acre, respectively, during trials over 4 seasons with between 9 and 13 varieties of spring oats. A further similar dressing in June had little effect on either grain or straw yield and was applied principally in an attempt to increase the yield of crude protein. For 6 varieties at 3 centres over 3 seasons the following average crude protein contents of grain were found: no N 11.29, May dressing 12.41, May and June dressings 13.62 per cent. Crude protein in straw was estimated for another set of trials and averaged: no N 2.75, May dressing 3.15, May and June dressings 3.60 per cent. The

recovery of applied N was studied also and for the May dressing averaged: grain 18.0, straw 8.8 per cent. For the June dressing the recoveries were 12.9 and 6.7 per cent., respectively.

It was concluded that a June top-dressing was not justified under the conditions prevailing in Hertfordshire.—P. C. Jowsey.

1656

MARTIN, H. F. and PEERS, F. G. Oat lipase. *Biochem. J.*, 1953, **55**, 523-529. [Res. Assoc. Brit. Flour-Millers, Cereals Res. Stat., St. Albans, Herts.]

Oat lipase is located in the outer pericarp layers of the grain and was obtained from groats by the "wet-scrubbing" method of Hutchinson *et al.* (*Nature*, 1951, **167**, 758). It is a true cereal lipase, not a product of the subepidermal fungal contaminants. It was purified 2000-fold on a dry matter basis compared with the activity of the original oatmeal. The purified preparation contains 6.7 per cent. N and 0.5 per cent. P, and has an optimum pH of 7.4 and an optimum temperature of 37° to 38° C. It splits off only one butyric acid radical from tributyrin and does not hydrolyse mono- and dibutyryns at pH 7.4 and 37° C. It will not attack Crill 6, a polyoxyethylene derivative of sorbitan laurate, and is not activated by the compensatory activators required, according to Willstätter, by pancreatic lipase.—W. Godden.

1657

TEMPLETON, W. H. and CARPENTER, B. R. The lipase activity of certain cereal products. *Analyst*, 1953, **78**, 726-727. [British Baking Indust. Res. Assoc., Chorleywood, Herts.]

The lipase of the original cereal may cause off-flavour in a baked product. A modification of the method of Hutchinson and Martin (Abst. 1317, Vol. 23) was used to study the problem, and data for 10 samples of cereals are tabulated. It was found that incubation with olive oil for 6 hr. under conditions which are described was the best method of estimating the enzyme content, and that it was the grains with a high lipase content which were associated with the occurrence of off-flavours. While due consideration must be given to other circumstances, *e.g.*, the proportion of the flour used and the time elapsing between mixing and baking, it is suggested that a cereal with an activity sufficient to hydrolyse more than 1.5 per cent. of olive oil, with the method described, must be regarded as undesirable.—D. Harvey.

1658

MCCALL, E. R., JURGENS, J. F., HOFFPAUIR, C. L., PONS, W. A. (Jr.), STARK, S. M. (Jr.), CUCULLU, A. F., HEINZELMAN, D. C., CIRINO, V. O. and

N.A. and R., April 1954

MURRAY, M. D. **Composition of rice. Influence of variety and environment on physical and chemical composition.** *J. Agric. Food Chem.*, 1953, **1**, 988-993. [S. Reg. Res. Lab., New Orleans, La.]

Eight varieties of rice were grown at 3 stations over 3 years. Samples were milled and analyses were made of hulls, true bran, endosperm and white rice.

Both variety and location had a highly significant effect on milling yield and physical composition, and also on the chemical composition of the true bran except for the ash. The N content of white rice and the ash of the hulls were significantly affected by variety; environment had a highly significant effect on the ash of the hulls and on the lipid, N, ash and starch of the endosperm.

White rice contained, on the average, 1.1 mg. total P per g., of which 46.1, 39.9, 10.3, 3.0 and 0.8 per cent. were nucleic P, phytin P, carbohydrate P, inorganic P and phosphatide P, respectively. Total P in bran amounted on the average to 26.5 mg. per g. and the fractions in the above order comprised 4.4, 89.9, 2.3, 2.5 and 1.0 per cent. of the total.

Trace elements present in all samples included Al, Cu, Fe, Mn, Ba, B and Zn.—P. C. Jowsey.

1659

FAVERO, A. **Variazioni del tenore in acido cianidrico del sorgo in rapporto all'epoca della semina e allo sviluppo della pianta. [Variations in the hydrocyanic acid of sorghum in relation to time of sowing and the stage of growth of the plant.]** *Riv. Zootec.*, 1953, **26**, 256-259. [Ist. Agronom. Gen., Univ. Milan.]

Four varieties of sorghum were investigated. In 1951 they were planted at 10-day and in 1952 at 3-weekly intervals. HCN was estimated in the top leaves of the main stem at different stages of growth: pre-bud, bud, flower half emerged and full flower. In 1952 the effect of N fertiliser was studied.

The HCN content tended to decrease with advancing state of growth. The time of sowing influenced the HCN content, but this was shown to be due to climate: increased rainfall reduced the HCN, and increased temperature just before sampling increased it. A relation was observed between the height of the plant and HCN content: at the same stage of growth the shorter varieties had more HCN than the taller. N fertiliser had no effect. Toxic levels of HCN were found in many samples, but it is pointed out that though the levels in the top leaves may be toxic, this is where there is the highest concentration, and when the whole plant is used for forage, particularly if mature, the percentage HCN may be at a safe level for stockfeeding.—T. D. Bell.

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Roots

1660

CLOSE, J., ADRIAENS, E. L., MOORE, S. and BIGWOOD, E. J. **Composition en acides aminés d'hydrolysats de farine de manioc roui, variété amère. [Amino-acid composition of hydrolysates of debittered cassava flour.]** *Bull. Soc. Chim. biol.*, 1953, **35**, 985-992. [Fac. Méd., Univ. Libre, Brussels.]

A sample of cassava flour from the Belgian Congo contained 0.323, 2.23, 0.87 and 0.30 per cent. total N, crude fibre, ash and fat, respectively, on a dry matter basis. Analysis of the hydrolysate by the method of Moore and Stein (Abst. 4469, Vol. 21) indicated the presence of ornithine in relatively large amount. N in 19 acids is tabulated as percentage of the total. Glutamic acid, ornithine, alanine, aspartic acid, lysine and arginine constituted about 40 per cent., NH_3 28.7 per cent. and cystine, methionine and tryptophan 1.5 per cent. The proteins of cassava flour, as well as being small in quantity, are poor in nutritive value as indicated by the amino-acids they contain.—D. Harvey.

Leafy Vegetables

1661

ROPERTO, R., BONOLDI, V. and PRESTES MONZONI, I. **Determinação do cálcio, fósforo, ferro e cinzas em algumas hortaliças da família das Cruciferae. [Estimation of calcium, phosphorus, iron and ash in some vegetables of the family Cruciferae.]** *Rev. Fac. Med. vet., São Paulo*, 1952, **4**, 523-527. [Esc. Politéc., Univ. São Paulo, Brazil.]

Ash, Fe, Ca and P were estimated in *Brassica oleracea*, vars. *bullata*, *acephala* and *capitata*, and *Roripa nasturtium*. In 16 locally grown samples the average values for the edible portions of the vegetables, in the above order, were, in mg. per 100 g.: ash 1565, 1551, 921, 1109; Fe 5.1, 3.0, 3.4, 3.8; Ca 210.4, 260.0, 75.0, 105.9; P 48.3, 44.5, 40.2, 43.5. The Ca:P ratios were 4.3:1, 6:1, 2:1 and 2.5:1.—M. B. Richards.

1662

ROPERTO, R., BONOLDI, V. and PRESTES MONZONI, I. **Determinação do cálcio, fósforo, ferro e cinzas em algumas hortaliças da família Compositae Linn. [Estimation of calcium, phosphorus, iron and ash in some vegetables of the family Compositae, Linn.]** *Rev. Fac. Med. vet., São Paulo*, 1952, **4**, 529-532. [Esc. Politéc., Univ. São Paulo, Brazil.]

Ash, Fe, Ca and P were estimated in the edible parts of *Lactuca sativa*, *L. scariola*, *Cichorium intybus*, and *C. endiva*. For 16 locally grown samples the average values for the edible portion

of the vegetables in the above order were, in mg. per 100 g.: ash 621, 807, 1360, 949; Fe 2.7, 3.0, 7.9, 6.2; Ca 48.4, 33.6, 73.2, 35.3; P 32.2, 34.6, 35.3, 16.6. The Ca : P ratios were 1.5 : 1, 0.95 : 1, 2.1 : 1 and 2.1 : 1.—M. B. Richards.

See also Abst. 2104.

Legumes

1663

KLIMENKO, V. G. Formy azota zerna i belkov nekotorykh sortov gorokha. [Forms of nitrogen in seeds and proteins of certain pea varieties.] *Biokhimiya*, 1953, **18**, 141-150. [Lab. Biokhim. Rast., Kishinevsk. Gosud. Univ.]

Eighteen varieties of peas were grown in the dry conditions of Moldavia and in damp conditions near the Carpathians. Seeds from peas grown under dry conditions contained considerably more total N than seeds from the same varieties grown under damp conditions. The environment also affected the protein content and its composition. An intervarietal difference was observed in protein composition. Most of the S was present as methionine. Arginine, histidine, lysine, cystine, methionine, tyrosine, and tryptophan were estimated. Data for all varieties are given in detail in tabular form.—W. Hughes.

1664

VIJAYARAGHAVAN, P. K. and SRINIVASAN, P. R. Essential amino acid composition of some common Indian pulses. *J. Nutrition*, 1953, **51**, 261-271. [Nutrit. Res. Labs., Indian Counc. Med. Res., Coonoor, S. India.]

Eleven amino-acids were estimated microbiologically in Bengal gram (*Cicer arietinum*), red gram (*Cajanus indicus*), green gram (*Phaseolus radiatus*), black gram (*P. mungo*), cowpea (*Vigna catjang*) and lentil (*Lens esculenta*). The results are given in detail. Limiting amino-acids were methionine, cystine and tryptophan.

P. C. Jowsey.

1665

FOWDEN, L. and DONE, J. A third unsaturated amino acid in groundnut plants: evidence for the occurrence of γ -amino- α -methylenebutyric acid. *Biochem. J.*, 1953, **55**, 548-553. [Dept. Botany, University Coll., Gower St., London, W.C.1.]

Fruits

1666

TOWNSLEY, P. M., JOSLYN, M. A. and SMIT, C. J. B. The amino acids in various tissues of citrus fruits and in orange protein. *Food Res.*, 1953, **18**, 522-531. [Dept. Food Technol., Univ. California, Berkeley.]

Amino-acids were identified chromatographically in ethanolic extracts of albedo, flavedo,

locular walls, juice vesicles, vascular tissue, seeds, navel and juice chromatophores of late Valencia and early green Washington Navel oranges, late grapefruit and tree-matured Eureka lemons.

Typical data for Valencia oranges only are presented.—P. C. Jowsey.

1667

SANTINI, R. (Jr.) Identification and determination of polybasic organic acids present in West Indian cherries (*Malpighia punicifolia* L.) and in three varieties of guava (*Psidium guajava*). *J. Agric. Univ. Puerto Rico*, 1953, **37**, 195-198. [Agric. Exp. Stat., Univ. Puerto Rico, Río Piedras.] Spanish summary.

The only polybasic organic acid found in West Indian cherries was L-malic acid, which comprised about 50 per cent. of the total acidity. Nearly all the remaining acidity was due to ascorbic and dehydroascorbic acids.

Citric acid was the main polybasic organic acid present in 3 varieties of guavas. Small amounts of tartaric, L-malic and total ascorbic acids were also present.—W. Godden.

1668

SANTINI, R. (Jr.) Determination of reducing and total sugars in West Indian cherry (*Malpighia punicifolia* L.) juice. *J. Agric. Univ. Puerto Rico*, 1953, **37**, 199-205. [Agric. Exp. Stat., Univ. Puerto Rico, Río Piedras.] Spanish summary.

Ascorbic acid in the juice of West Indian cherries interferes in the estimation of reducing and total sugars when the method of Lane and Eynon (*J. Soc. Chem. Indust.*, 1923, **42**, 325) is used. If the ascorbic acid is estimated separately and the factor 0.686 (glucose corresponding to 1 mg. ascorbic acid) is applied, the true value for the sugar is obtained. Five samples of juice contained from 3.0 to 3.6 per cent. reducing sugars or 3.0 to 3.7 per cent. total sugars. There was no appreciable loss of sugars when the juice was stored at 45° F. or at room temperature for 1 year.—W. Godden.

Other Types

1669

PONS, W. A. (Jr.), HOFFFAUR, C. L. and HOPPER, T. H. Gossypol in cottonseed. Influence of variety of cottonseed and environment. *J. Agric. Food Chem.*, 1953, **1**, 1115-1118. [S. Reg. Res. Lab., New Orleans, La.]

Seed from 8 commercial varieties of cotton grown in 13 locations during the seasons 1947 to 1949 was analysed. The range in gossypol contents, which included gossypol-like pigments, was wide, from 0.39 to 1.70 per cent. of moisture-free kernels. It may be a genetic character. High

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temperatures tended to produce kernels with low, and high rainfall kernels with high gossypol contents. The effects of high temperature and high rainfall were greatest when they occurred during the period of maturation, i.e., the 35 days before boll-opening, when it is known that gossypol is synthesised. The 3 varieties with the lowest gossypol contents did not react to temperature changes in the same way as the others; with one exception there was little varietal difference in response to rainfall variation.

It is concluded that varieties with a low gossypol content might be developed and it is suggested that the ratio of N or protein to gossypol should be studied with the aim of maintaining the protein content of the meal at a high level.—D. Harvey.

1670

CRAIG, B. M. **The fatty acid composition of safflower seed oil.** *Canad. J. Technol.*, 1953, **31**, 202–207. [Prairie Reg. Lab., Nat. Res. Counc. Canada, Saskatoon, Sask.]

Safflower seed oil was methylated and fractionated by distillation.

Two samples contained 78.5 and 80.0 per cent. linoleic acid. From about 4 to 7 per cent. of palmitic, stearic and oleic acids were present and, in much smaller amounts, myristic, arachidic, behenic, hexadecenoic, eicosenoic, erucic and linolenic acids.—P. C. Jowsey.

1671

PEREIRA PINTO, G. Contribuição ao estudo químico do sêbo de ucuúba. [**Chemical study of ucuúba fat.**] *Bol. téc. Inst. agronom. Norte*, 1951, No. 23, 5–63. [Secç. Quím., Inst. Agronom. Norte, Brazil.] English summary.

More than 20 species of the genus *Virola* are indigenous to the Amazon basin, and of these *Virola surinamensis* (ucuúba branca) produces the most useful fat.

The dried seeds of this tree weigh on the average 1.8 g. and the kernel makes up 82 per cent. of this. Dried kernels had the following percentage composition: protein 11.6, ether extract 67.0, N-free extract plus fibre 19.3 and ash 2.1.

Light petroleum, carbon disulphide and benzene are the best solvents for fat extraction. For hydraulic extraction the temperature should be maintained between 70° and 90° C. for seeds containing from 7 to 8 per cent. moisture.

The crude fat contained fatty acids 88.0, resins (?) 4.4, unsaponifiable matter 2.5 and glycerol radicals 5.1 per cent. Capric, lauric, myristic, palmitic, stearic, oleic and linoleic acid were identified in the fat, the value of which lies in its content of trimyristin and myristic acid: the latter comprised 61.3 per cent. of the total fatty acids.

P. C. Jowsey.

1672

PEREIRA PINTO, G. O óleo de patauá. [**Patauá oil.**] *Bol. téc. Inst. Agronom. Norte*, 1951, No. 23, 65–77. [Secç. Quím., Inst. Agronom. Norte, Brazil.] English summary.

Palmitic, stearic, oleic, linoleic and probably myristic acids were identified in the oil from *Jessenia bataua*. Oleic acid comprised 77.5 per cent. of the total fatty acids.

Physicochemical constants of the palm oil are listed. It closely resembles olive oil and may be used for similar purposes.—P. C. Jowsey.

1673

KOBLEC, J. Okurky, jejich složení a význam pro výživu. 2. Okurky nakládačky a jejich neustrojené součásti se zřetelem na jejich t. zv. zásadotvornost. [**Cucumbers, composition and significance in nutrition. 2. Pickled cucumbers and their inorganic constituents with reference to base excess.**] *Sborn. čl. Akad. Zéměd.*, 1953, **26**, 447–454. Russian and German summaries.

Data are given for the percentages of the usual inorganic constituents in pickled cucumbers. Traces of Mn, Ni, Cu, Zn and Pb are reported but Ti, Va, As, and B were not detected. The values were calculated as mg. equivalents and from these figures the base excess was estimated.

W. Godden.

1674

MOORJANI, M. N. **Nutritive value of lotus rhizome.** *Bull. Central Food Technol. Res. Inst. Mysore*, 1953, **2**, 263. [Div. Food Processing.]

A single sample of lotus (*Nelumbium speciosum*) rhizome, which is used as a vegetable in northern India, contained water 83.8, protein 2.7, fat 0.1, carbohydrate 11.2, fibre 0.8 and ash 1.1 per cent.

D. Harvey.

1675

CHIAO, J. S. and PETERSON, W. H. **Yeasts. Methionine and cystine contents.** *J. Agric. Food Chem.*, 1953, **1**, 1005–1008. [Dept. Biochem., Univ. Wisconsin, Madison.]

The optimum conditions for the liberation of methionine from yeast were hydrolysis for 1 hr. with 7 N HCl, from 1 to 2 hr. with 5 N HCl or 3 hr. with 3 N HCl, at 120° C. in an autoclave.

Seven commercial yeasts contained from 0.48 to 0.75 cent. methionine and 0.21 to 0.45 per cent. cystine on a dry matter basis.

Twenty species and strains of yeast were grown on Hawaiian molasses medium. Yields on the basis of sugars fermented ranged from 50 to 83 per cent. Methionine content ranged from 0.17 to 1.0 per cent. and cystine content from 0.19 to 0.58 per cent. on a dry matter basis.

The methionine content of *Saccharomyces cerevisiae* F-35 was not affected by addition of cystine,

12

threonine or choline to the medium, but 14.2 mg. cystine per 50 ml. medium increased the yield from 35.8 to 46.3 per cent. on the basis of sugars fermented.

Ammonium salts increased the yield and protein content of the yeasts, but had no effect on the methionine content.—P. C. Jowsey.

1676

SCHIELER, L., MCCLURE, L. E. and DUNN, M. S. **The amino acid composition of *Chlorella*.** *Food Res.*, 1953, **18**, 377–380. [Chem. Lab., Univ. California, Los Angeles.]

Chlorella pyrenoidosa and *C. vulgaris* were cultured aseptically. The cells were harvested by centrifuging, extracted first with acetone and then with ether and finally twice with cold and once with hot trichloroacetic acid, and dried. Seventeen amino-acids were estimated in the protein hydrolysates. The results indicated that *Chlorella* protein could serve as a source of amino-acids in animal feeding if supplemented with cystine, methionine and histidine.—W. Godden.

Pasture, Hay and Silage

1677

WYLAM, C. B. **Analytical studies on the carbohydrates of grasses and clovers. 3. Carbohydrate breakdown during wilting and ensilage.** *J. Sci. Food Agric.*, 1953, **4**, 527–531. [Dept. Chem., Univ. Edinburgh.]

With the methods previously described (Abst. 27, Vol. 22) it was found that when grass was allowed to wilt in the open there was considerable breakdown of sucrose and fructosan. If the grass was kept in a close-stoppered bottle the breakdown was more rapid and more extensive. The decrease in fructosan was not accompanied by a corresponding rise in fructose. When fresh grass was inoculated with a culture of mixed strains of lactobacilli and incubated under anaerobic conditions at 30° C. in the laboratory, there was almost complete disappearance of sucrose and fructosan and a considerable rise in fructose with the appearance of a small amount of galactose. The rise in fructose was much greater by the end of 8 months. The advantages of allowing grass to wilt before ensiling are discussed.—W. Godden.

1678

MOON, F. E. **Improving the nutritive value of Lothians' seeds-hay.** *Scot. Agric.*, 1953, **33**, 101–105. [Edinburgh and E. Scotland Coll. Agric.]

Lothian seeds hay is lower in protein than is generally reported for other areas. The average content, from analyses made between 1948 and

1951, was 5.98 per cent. of dry matter, with a digestibility of 35.8 per cent. The protein content can be increased by early cutting, or by increasing the amount of clover in the mixture. The former method means decreased yield and more difficulty in drying; attempts at the latter do not always meet with success. Another method is to apply a top-dressing of N fertiliser 2 or 3 weeks before cutting. Response to treatment depends on the intensity of the fertilising, the time interval between application and cutting and the rainfall after application. Average protein percentage in 4 years' tests on treated plots was 7.28; the digestibility of the protein also rose to 47.9 per cent. and the digestible protein was increased by 54 per cent. Since the other nutrients were not affected, the nutritive ratio was also improved, and the hay was suitable for maintenance of cattle without the use of a great deal of protein concentrate. The treatment also increased the yield of aftermath, though its protein percentage was below that of control plots. Recovery of the N applied was 40 per cent. in the first cut and a further 5 per cent. in the aftermath.—T. D. Bell.

1679

BOYLE, C. and RYAN, J. J. **The effect of late applications of nitrogen on the composition and yield of grass.** *J. Dept. Agric., Éire*, 1951–52, **48**, 44–48. [Univ. Coll., Cork.]

Duplicate plots of permanent pasture, each 1/100 acre in area, received the following treatments: nil (control), 1 or 2 cwt. per acre sulphate of ammonia, 4 or 8 tons per acre liquid manure containing about 0.14 per cent. N (8 tons approximately equalled 1 cwt. sulphate of ammonia). The trials were yearly for 6 years.

Average yields of dry matter were, in the above order, 51.0, 50.9, 51.2, 54.1, 54.6 cwt. per acre and the dry matter contained crude protein 9.40, 10.80, 12.32, 9.90, 10.32 per cent. The average yields of crude protein were 4.80, 5.50, 6.31, 5.35, 5.63 cwt. per acre.

It was concluded that late applications of N gave profitable results.—P. C. Jowsey.

1680

SEARS, P. D. **Pasture growth and soil fertility. 1. The influence of red and white clovers, superphosphate, lime, and sheep grazing, on pasture yields and botanical composition.**

MELVILLE, J. and SEARS, P. D. **2. The influence of red and white clovers, superphosphate, lime, and dung and urine on the chemical composition of pasture.**

SEARS, P. D. and EVANS, L. T. **3. The influence of red and white clovers, superphosphate, lime, and dung and urine on soil composition, and on earthworm and grass-grub populations.**

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SEARS, P. D. 4. The influence on soil fertility of clovers, superphosphate, lime, dung and urine applied to the pastures, as measured by the growth of subsequent forage crops. 5. The effects of nitrogenous fertilisers, and of "day" and "night" grazing. *N.Z. J. Sci. Technol. [A]*, 1953, **35**, Suppl. 1, 1-29; 30-41; 42-52; 53-67; 68-77. [Grasslands Div., D.S.I.R., Palmerston North.]

1. The effects of clovers, superphosphate, grazing, and dung and urine, singly and combined, on the yield and botanical composition of a mixed grasses pasture were studied over 5 years. The results are presented in detail.

No new principle of general applicability emerged but the results emphasised the complexity of the factors involved in the term "pasture production".

2. In this paper detailed data are given on the N, Ca, K and P contents of the herbage produced under the treatments described in Part 1.

3. Organic matter, N, P and exchangeable Ca, Mg and K were estimated in top soil from the plots used in the above tests. Estimates were also made of the earthworm and grass-grub (*Odontria* spp.) populations. The results are given in detail.

4. Data are presented for the yields and composition of rape, maize and Italian ryegrass crops grown subsequent to the pasture treatments described in Part 1. The total growth and the nutrients removed in the first rape and maize crops after the pasture were closely related to the previous pasture yields.

The results demonstrated the necessity of building up the fertility of pastures before taking a subsequent crop.

5. The yields and botanical composition of a ryegrass white clover pasture under different conditions of grazing and N fertilisation were studied.

N fertilisers had no marked effect on the total or seasonal yields and increased the grass: clover ratio only slightly.

Separate "day" and "night" grazing by sheep had a pronounced effect. Night grazing, from 4.30 p.m. to 8 a.m., induced extra growth, mainly of grass; day grazing caused a rise in the proportion of clover and a fall of total production. Subsequent rape crops grew better on the "night-grazed" plots.

The results are given in detail.—P. C. Jowsey.

1681

NATH, N. and DAS, N. B. Effect of growth stage on the chemical composition of some indigenous grasses of India. *Indian J. Vet. Sci.*, 1953, **23**, 43-51. [Indian Agric. Res. Inst., New Delhi.]

The grasses *Amphilophis odorata*, *A. glabra* and *Isilema laxum* were sampled at the young, pre-

flowering, flowering and ripe stages of growth and chemical analyses were made.

In all the grasses protein, ether extract, soluble ash, P_2O_5 , Na, K and Cl decreased and fibre increased with increasing maturity. N-free extract varied irregularly but tended to decrease. *I. laxum* had the highest average contents of protein, ether extract and minerals and also retained a high nutrient content longer than the others. The *Amphilophis* spp. had the most favourable Ca:P ratio in the young stage of growth and *I. laxum* in the flowering stage.—P. C. Jowsey.

1682

SHEPHERD, J. B., GORDON, C. H., WISEMAN, H. G., MELIN, C. G., CAMPBELL, L. E. and ROANE, G. D. Comparisons of silages stored in gas-tight silos and in conventional silos. *J. Dairy Sci.*, 1953, **36**, 1190-1200. [Bur. Dairy Indust., U.S. Dept. Agric., Washington, D.C.]

Dry matter, protein, ether extract, N-free extract, ash, sugar, carotene and pH were estimated in alfalfa-grass and soya bean silages stored in gas-tight and conventional silos. Feeding experiments with cows were made with some of the silages. The results are given in detail.

Silages stored in gas-tight and conventional tower silos were similar in composition, palatability, aroma, quality and feeding value. More dry matter, nutrients and carotene were preserved in the gas-tight silos, mainly because there was little or no top or side spoilage. Below the top silage in the tower silos, dry matter and nutrient losses were about the same as those in the gas-tight silos.

Air must be rigidly excluded from gas-tight silos during closed storage and, as far as practicable, when the silage is being used.—P. C. Jowsey.

1683

PERKINS, A. E., PRATT, A. D. and ROGERS, C. F. Silage densities and losses as found in laboratory silos. *Ohio Agric. Exp. Stat. Res. Circular* No. 18, April 1953, pp. 16. [Wooster, Ohio.]

A laboratory silo of about 9 lb. capacity is described and illustrated.

Silos of this type were filled with chopped maize sampled at different stages of growth or with chopped meadow herbage consisting typically of a mixture of clover, alfalfa, grasses and cereals. The average dry matter (DM) contents of the maize and meadow herbage samples ranged from 16.1 to 38.8 and 17.1 to 33.4 per cent., respectively. The contents of the silos were subjected to pressures ranging from 2 to 16 lb. per sq. in.

The results are presented in detail. A typical 9-lb. maize sample with a DM content of between 23 and 27 per cent. ensiled under pressures of 4, 6, 8, 12 and 16 lb. per sq. in. lost 0.147, 0.570, 0.613, 1.254 and 1.500 lb. by seepage.

Tables are presented relating the applied pressure and stage of growth to the density and weight of DM per c. ft. of silage. A maize crop with a DM content of 25.8 per cent., ensiled under a pressure of 2 to 4 lb. per sq. in. produced a silage which weighed, when moist, 49.0 lb. per c. ft. and which contained 12.67 lb. DM per c. ft. The same crop ensiled under a pressure of 14 to 16 lb. per sq. in. produced silage with a moist weight of 56.2 lb. per c. ft. and containing 14.48 lb. DM per c. ft.

It was concluded that the DM content of a crop should exceed 30 per cent. to avoid seepage. Juice lost by seepage from an immature crop may carry with it up to 10 per cent. of the DM originally ensiled. The results also indicated that dry materials do not pack well even if finely chopped and power and money can be saved by a coarser chopping to fill the lower 2/3 of the silo. The upper 1/3 only should be filled with moist, finely cut material.

In all silages the DM per c. ft. of settled silage varied less than the weight per c. ft. of moist silage and it is suggested that calculations of rations should be based on the former figure.

Finely cut material with a high moisture content packed too tightly and produced a cold silage with a high loss by seepage. Losses caused by escaping gases were less than 2 per cent.—P. C. Jowsey.

1684

- ROUDIER, A. La structure chimique des hemicelluloses de la paille de blé. [Chemical structure of the hemicelluloses of wheat straw.] *C.R. Acad. Sci.*, 1953, **237**, 840-842.
See Title 1444, Vol. 33.

1685

- BISHOP, C. T. Crystalline xylans from straws. *Canad. J. Chem.*, 1953, **31**, 793-800. [Div. Appl. Biol., Nat. Res. Council, Ottawa.]
See also Abst. 2165.

MISCELLANEOUS

1686

- JACKEL, S. S., SCHAEFER, W. E. and SCHULTZ, A. S. On the changes in the soluble solids and carbohydrates of bread crumb during the aging of

conventional and bacterial alpha-amylase-supplemented white breads. *Cereal Chem.*, 1953, **30**, 522-531. [Fleischmann Labs., Standard Brands, Inc., Stamford, Conn.]

1687

- BANASIK, O. J. and HARRIS, R. H. Observations on reducing groups and color changes in macaroni discs. *Food Res.*, 1953, **18**, 480-491. [N. Dakota Agric. Exp. Stat., Fargo.]

1688

- MITRA, S. N. and ROY, S. C. The "albuminoid ammonia value" in the analysis of fruit juices, squashes and cordials. *Analyst*, 1953, **78**, 681. [W. Bengal Pub. Health Lab., Sch. Trop. Med., Calcutta.]

1689

- GRAY, H. E. and FRAENKEL, G. Fructomaltose, a recently discovered trisaccharide isolated from honeydew. *Science*, 1953, **118**, 304-305. [Dept. Entomol., Univ. Illinois, Urbana.]

1690

- SAHA, K. C., SEN, D. P. and MUKHERJEE, P. C. Investigations on fish-pond manures: 1. Studies on the nutritional values of some manure materials used for fertilizing fish-pond. *Ann. Biochem. Exp. Med.*, 1951, **11**, 203-206. [Technol. Lab., Directorate Fish., Govt. W. Bengal.]

Moisture, N, protein, Ca, P and K were estimated in 10 materials used as fish-pond fertilisers in India.

Fishmeal contained 7 per cent. N and was the richest source of this element, followed by mustard-seed cake and water hyacinth (*Eichhornia crassipes*) plants with 4.76 and 4.0 per cent. N, respectively.

Crabmeal contained most Ca, 12.3 per cent., followed by Jhowjhanji (*Hydrilla verticillata*), fishmeal and Kantajhanji (*Utricularia stellata*), containing 4.8, 3.0 and 2.6 per cent., respectively. Kantajhanji was rich in P, 3.0 per cent. Banana bark and arum stem had the most K, 5.1 and 4.9 per cent., respectively.

Fishmeal, crabmeal and mustardseed cake are expensive and studies are being made with a view to devising a fertiliser composed of the less costly materials.—P. C. Jowsey.

3. VITAMINS

GENERAL

1691

BIAVATI, F., MANFREDINI, P. and BORGATTI, G. Rapporti tra vitamine e sali inorganici dell'alimento studiati nel ratto. [**Studies on rats of the relationship between vitamins and inorganic salts in the food.**] *Boll. Soc. ital. Biol. sper.*, 1953, **29**, 326-329. [Ist. Fisiol. Gen., Univ. Bologna.]

A preliminary attempt was made to ascertain whether the lack of any individual salt was responsible for the longer survival time of rats wholly deprived of vitamins and salts than of those deprived of vitamins only (Absts. 3285, Vol. 21; 229, Vol. 23). Addition of Ca was the most effective in reducing the survival time to that of rats given all salts but no vitamins.—E. M. Hume.

1692

MOURIQUAND, G. Homéostasie et rééquilibre chronaxique après chocs vitaminiques, toxiques ou sportifs. [**Homeostasis and restoration of chronaxie equilibrium after shock doses of vitamins, toxic substances or muscular exertion.**] *Presse méd.*, 1953, **61**, 1593-1594. [Lyons.]

A short article summarising the author's researches.—L. Wills.

1693

THAYER, R. H. **Vitamin levels in high energy layer-breeder rations.** *Poultry Sci.*, 1953, **32**, 927. *Proc.* [Oklahoma Agric. and Mech. Coll., Stillwater.]

1694

SQUIBB, R. L., GUZMÁN, M. and SCRIMSHAW, N. S. **Effect of pasture, dehydrated ramie meal, and sex on five blood serum constituents of New Hampshire chickens in Guatemala.** *Poultry Sci.*, 1953, **32**, 953-957. [Inst. Agropecuario Nac., Guatemala.]

New Hampshire pullets received a basal laying mash of ground sorghum and a protein concentrate,

or this mash supplemented with green kikuyu grass (*Pennisetum clandestinum*) or a dehydrated ramie (*Boehmeria nivea*) meal. Blood samples were taken at intervals of 3 weeks for 168 days. Pullets receiving the supplements had consistently higher amounts of total carotenoids and vitamin A in the blood serum than had birds on the basal ration alone. Serum riboflavin was highest in birds receiving kikuyu grass. Serum protein and ascorbic acid were similar in all groups. Sex differences in blood constituents were studied at 6, 12, 48 and 72 weeks of age, but no difference in total carotenoids, vitamin A, total proteins or ascorbic acid was found. The serum riboflavin was significantly higher in the females than in the males. In pullets aged 48 and 72 weeks riboflavin was higher than in pullets 6 and 12 weeks old, but in cockerels riboflavin did not vary with age.

E. M. Cruickshank.

1695

SHULTZ, F. T., GRAU, C. R. and ZWEIGART, P. A. **Vitamin supplements and squab production.** *Poultry Sci.*, 1953, **32**, 762-768. [Dept. Poultry Husb., Univ. California, Berkeley.]

Commercial pigeons of 3 strains received a basal ration of sweet corn, kaffir corn and milo, green peas, wheat and minerals, supplemented with vitamins A and D, riboflavin or vitamin B₁₂. The birds receiving riboflavin produced significantly more squabs than birds on the basal diet alone, which was due mainly to an increase of 10 per cent. in the hatching capacity of the eggs, and to a less extent to increased viability of the squabs. In birds receiving vitamin B₁₂ the increase in hatching capacity was 3 per cent., but it was not statistically significant, and the viability of the squabs was not improved. Addition of vitamins A and D was without effect, probably because the diet contained green peas and the squabs had access to sunlight. The supplements had no constant effect on the weight of the squabs.

E. M. Cruickshank.

See also Abst. 2072.

VITAMIN A

1696

FLESCH, P. **A colorimetric method for determination of vitamin A and carotene by perchloric acid.** *Proc. Soc. Exp. Biol. Med.*, 1953, **84**, 148-149. [Dept. Dermatol., Sch. Med., Univ. Pennsylvania, Philadelphia.]

To 0.1 ml. of a chloroform solution containing vitamin A and carotene was added 1.6 ml. amyl acetate followed by 0.4 ml. concentrated HCl.

After the mixture had stood for 5 min. at room temperature, 2 ml. of a perchloric acid reagent, prepared by adding 1 part distilled water to 3 parts of a concentrated solution of perchloric acid, were added, followed by 0.4 ml. absolute alcohol. The mixture was shaken vigorously until the layers were mixed. Carotene gave a bluish-green colour with a broad maximum of absorption between 725 and 760 mμ. With vitamin A a blue colour

developed immediately, and almost instantly changed to purplish-red with maximum absorption between 520 and 530 $m\mu$. This colour remained for from 25 to 30 min., after which it turned yellow. Carotene was estimated directly by measuring the absorption at 750 $m\mu$, and vitamin A was calculated by subtracting from the absorption at 525 $m\mu$ the absorption value which corresponded to carotene at this wavelength. The colour developed with perchloric acid followed Beer's law over wider ranges than the colours obtained with previous methods, but the sensitivity was somewhat less.—R. J. Ward.

1697

McCOORD, A. B. **Use of 1, 2-dichloroethane in the Carr-Price antimony trichloride reagent for the determination of vitamin A.** *J. Lab. Clin. Med.*, 1953, **42**, 660-662. [Dept. Paediat., Sch. Med., Univ. Rochester, N.Y.]

Chloroform, normally used as the solvent for antimony trichloride in the preparation of the reagent for estimating vitamin A, has the disadvantage that it decomposes after one or two months' storage. In place of chloroform 1:2-dichloroethane may be used, and the solutions were found not to deteriorate on standing. It was found also that commercial specimens do not require to be purified. Solution of 30 g. $SbCl_3$ in 100 ml. dichloroethane gave the best results; more dilute solutions gave blue colours which were more transient. As with chloroform, precautions are necessary with dichloroethane, and prolonged breathing of its vapour must be avoided. An Evelyn photo-electric colorimeter with filter 620 was used to estimate vitamin A, but the reagent could be used with other colorimeters. When a given amount of vitamin A was treated with the dichloroethane $SbCl_3$ reagent and with the usual chloroform $SbCl_3$ reagent the intensity of the resulting blue colour was the same.

I. M. Sharman.

1698

MITCHELL, H. L. and SILKER, R. E. **Carotene. Determination in alfalfa meal treated with N, N'-diphenyl-p-phenylenediamine.** *J. Agric. Food Chem.*, 1953, **1**, 1163-1165. [Kansas Agric. Exp. Stat., Manhattan.]

The A.O.A.C. method of analysis has been found to give falsely high values for the carotene content of alfalfa meals that have been treated with Dpppd (N,N'-diphenyl-p-phenylenediamine) (Abst. 4123, Vol. 23). It was, therefore, modified by evaporation of the extract to remove acetone, addition of light petroleum, chromatography on tricalcium phosphate instead of magnesia, and measurement of the extinction of the eluate at 436 $m\mu$. A filter aid was mixed with some brands of tricalcium phosphate to hasten percolation. When meals

were analysed by both the modified and the unmodified A.O.A.C. method the former gave slightly lower values for carotene. The reasons are discussed. Meals were treated separately with up to 0.2 per cent. of Dpppd and 6-ethoxy-2:2:4-trimethyl-1:2-dihydroquinoline as anti-oxidants. The latter increased the apparent value for carotene by 5 per cent. with the A.O.A.C. method, and not at all with the phosphate method. The addition of Dpppd increased the apparent carotene value by 5 per cent. with the phosphate method and to a much greater extent with the A.O.A.C. method. The phosphate method is therefore recommended as satisfactory for estimating carotene in alfalfa meals that have been treated with Dpppd.—V. H. Booth.

1699

SIRONVAL, C. A propos de la chromatographie sur papier de la chlorophylle et des caroténoides des feuilles. [Paper chromatography of chlorophyll and carotenoids of leaves.] *Arch. internat. Physiol.*, 1953, **61**, 563-564. *Proc. [Lab. Physiol. Vég., Univ. Liège.]*

1700

GOODWIN, T. W. and OSMAN, H. G. **ζ -Carotene.** *Arch. Biochem. Biophys.*, 1953, **47**, 215. [Dept. Biochem., Univ. Liverpool.]

A carotenoid closely related in some of its properties to ζ -carotene and closely associated with it was isolated from *Phycomyces blakesleeana*. The new pigment had adsorption maxima at 452, 421 and 400 $m\mu$, those of ζ -carotene being at 421, 400 and 378 $m\mu$; its adsorption affinity for alumina was less than that of ζ -carotene.

V. H. Booth.

1701

WALD, G., BROWN, P. K. and SMITH, P. H. **Cyanopsin, a new pigment of cone vision.** *Science*, 1953, **118**, 505-508. [Biol. Labs., Harvard Univ., Cambridge, Mass.]

Three visual pigments have been known heretofore. Retinene₁ combines with rod opsin to make rhodopsin, or with cone opsin to make iodopsin. Retinene₂ combines with rod opsin to make porphyropsin. Preparation of the fourth possible combination, retinene₂ with cone opsin, is here described. The substance obtained was a blue, light-sensitive pigment with an absorption maximum at 620 $m\mu$. The name cyanopsin is proposed for it.—E. M. Hume.

1702

DEUEL, H. J. (Jr.) and GREENBERG, S. M. **A comparison of the retention of vitamin A in margarines and in butters based upon bioassays.** *Food Res.*, 1953, **18**, 497-503. [Dept. Biochem., Univ. S. California, Los Angeles.]

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Vitamin A in 8 brands of margarine and 4 samples of butter was estimated biologically. Cod liver oil was first used as standard, but was later replaced by vitamin A acetate. Two of the margarines contained vitamin A alcohol, 4 a distilled ester and 2 a natural ester. The original vitamin A content of the margarines ranged from 34.2 to 53.0 U.S.P.U. per g. and of the butter from 37.5 to 67.0. After 2 years at 14° F. the average retention of vitamin A was 83 per cent. for the margarine and 78 per cent. for the butter. The average percentage retentions were, respectively, after from 52 to 60 weeks at 41° F. 80 and 84, after 45 weeks at 64° F. 53 and less than 45, and after 41 weeks at 82° F. 35 and 34.—R. J. Ward.

1703

MELNICK, D., LUCKMANN, F. H. and VAHLTEICH, H. W. **The retention of preformed vitamin A and carotene in margarine based upon physico-chemical assays.** *Food Res.*, 1953, **18**, 504-510. [Res. Labs., The Best Foods, Inc., Bayonne, N.J.]

Samples of coloured and uncoloured margarine produced at 3 different plants over 18 months were tested for carotene and vitamin A by a spectrophotometric method, when fresh and after 3 months at 45° F. The average vitamin A content of the fresh uncoloured margarine from the 3 plants was 17,200, 16,900 and 17,250 U.S.P.U. per lb. After 3 months at 45° F. the average percentage retention of vitamin A was 99.7, 98.2 and 98.5, respectively. For the coloured margarine the vitamin A content of the fresh samples was 11,900, 11,100 and 11,100 U.S.P.U. per lb., with respective percentage retentions of 99.7, 98.0 and 98.5 after 3 months at 45° F. The average carotene content of the fresh coloured margarine was 5700, 6700 and 6750 U.S.P.U. per lb. with respective percentage retentions of 96, 97.1 and 96.3 after 3 months at 45° F.

When the margarines were held at 75° F. for 1 month, the average percentage retention for the uncoloured samples from the 3 plants was 91.8 by the spectrophotometric method and 96.3 by the SbCl_3 method. For the coloured margarine the corresponding values were 91.6 and 98.0. The difference in results of the two methods was attributed to the presence of anhydrovitamin A in the margarine. The average retention of carotene was 93.6 per cent.—R. J. Ward.

1704

MURRAY, T. K. and CAMPBELL, J. A. **A note on the stability of vitamin A in Canadian margarine.** *Canad. J. Technol.*, 1953, **31**, 193-195. [Food and Drug Labs., Dept. Nat. Health Welfare, Ottawa.]

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Samples of margarine from 13 manufacturers were stored at room temperature and at 5° C. for 12 months. Vitamin A was estimated by the SbCl_3 method after 3, 6, 9 and 12 months at room temperature and after 12 months at 5° C. The peroxide number was determined on the material when fresh and after 12 months' storage at room temperature and at 5° C. The average vitamin A content of 12 of the brands which satisfied the label claim was 4000 I.U. per 100 g. After 12 months' storage, 10 of the products still met or surpassed the label claim with an average vitamin A content of 3720 I.U. per g., which represented a loss of 10 per cent. With the refrigerated samples the loss was 1.7 per cent., with the same 10 brands equalling or surpassing the label claim. Results of peroxide estimations showed that there was a positive correlation between vitamin A loss and peroxide number.—R. J. Ward.

1705

ROY, B. R. **Effect of sesame oil on carotene in hydrogenated groundnut oil.**

Carotene-fortified vanaspati (hydrogenated groundnut oil); heat-treatment in presence of an antioxidant. *Ann. Biochem. Exp. Med.*, 1952, **12**, 63-66; 75-78. [Dept. Appl. Chem., Univ. Coll. Sci. Technol., Calcutta.]

Refined sesame oil, a compulsory addition to hydrogenated groundnut oil, increased the peroxide value and destroyed carotene during storage.

Ethyl gallate, 0.01 per cent., gave partial protection to both fat and carotene during short heating at 250° C.—V. H. Booth.

1706

KARMAKAR, G., NEOGI, S. and RAJAGOPAL, K. **The stability of carotene concentrate from water-hyacinth dissolved in vegetable oils.** *Ann. Biochem. Exp. Med.*, 1952, **12**, 1-16. [Dept. Biochem. Nutrit., All-India Inst. Hyg., Calcutta.]

A carotene concentrate was prepared from leaves of the water hyacinth. Portions were dissolved in arachis oil and in mustard oil, and the carotene was estimated at intervals. The loss of carotene was much greater at high than at low temperatures and the percentage loss was greatest with lowest initial concentration. Wheat germ oil, *dl*-methionine and α -tocopherol were added to solutions in oil, separately or together. Presence of 0.01 per cent. α -tocopherol reduced the percentage loss of carotene from mustard oil in 12 hr. at 100° C. from 48 to 28. The other anti-oxidants had less effect. Carotene in either of the oils was quickly destroyed by ultraviolet light.

V. H. Booth.

1707

WALSH, K. A. and HAUGE, S. M. **Carotene. Factors affecting destruction in alfalfa.** *J. Agric. Food Chem.*, 1953, **1**, 1001-1004. [Dept. Biochem., Purdue Univ. Agric. Exp. Stat., Lafayette, Ind.]

Samples of alfalfa, autoclaved, blanched or untreated, were frozen and then ground in ice water. Portions of the paste were suspended in water or buffer solution and incubated over lamps or in the dark. Carotene was then extracted and the loss estimated.

There seemed to be three mechanisms of destruction. Loss from autoclaved alfalfa, incubated in light, was called photochemical loss; loss from autoclaved alfalfa, incubated in darkness, was assumed to be due to auto-oxidation. Loss from untreated alfalfa, incubated in light, represented the total loss from all mechanisms. The auto-oxidative loss was small and was included in each of the others. It was difficult to assess the relative importance of the three mechanisms under field conditions because inhibition of one system seemed to permit another to proceed faster.

The enzyme system had an optimum pH between 4 and 5 and an optimum temperature of about 43° C. The photochemical system was not sensitive to pH or much affected by temperature. Prolonged blanching or autoclaving had little effect on the photochemical loss, and cyanide had none. A large amount of cyanide was needed to inhibit the enzyme system and inhibition was only partial. Unless the system was well buffered, cyanide reduced the activity of the enzyme also by raising the pH, which may explain why earlier workers found complete inhibition with cyanide.

V. H. Booth.

1708

NIEMAN, C. and CLAASSEN, V. Onbekende factoren met vitamine A-activiteit in dierlijke vetten en dierlijke eiwitten. [Unidentified substances with vitamin A activity in animal fats and animal proteins.] *Voeding*, 1953, **14**, 539-553. [Nederlands Inst. Volksvoeding, Amsterdam.] English summary.

A review.

1709

HERB, S. F., RIEMENSCHNEIDER, R. W., KAUNITZ, H. and SLANETZ, C. A. **Nature of the "vitamin A-like factor" in lard.** *J. Nutrition*, 1953, **51**, 393-402. [E. Reg. Res. Lab., Philadelphia, Pa.]

A fraction from the molecular distillation of lard had a biological activity of 4.5 "units" vitamin A per g., and was subjected to further molecular distillation. About 15 per cent. was removed as 4 fractions. Another portion was crystallised from acetone, a precipitate was removed at 0° C.

and another at -45° C. Biological tests were made on all the fractions. Molecular distillation yielded the fractions with the highest activity, and when the unsaponifiable residues of these fractions were examined spectrophotometrically, an inflection in the spectral curve was obtained at about 325 mμ. A further quantity of the distillate was redistilled in the same way except that about 2.5 per cent. was removed as a first fraction and 7.5 per cent. as a second fraction. Chromatographic fractionation of the unsaponifiable residues of these two fractions, and subsequent spectrophotometric examination of the eluted fractions, gave only qualitative indications of the presence of vitamin A because of too great absorption in the region from 300 to 320 mμ. The undistilled fraction, which had little unsaponifiable matter, was saponified and fractionated chromatographically. Eluted fractions which gave the Carr Price reaction were combined and examined spectrophotometrically. The curves obtained showed a slight maximum at 325 mμ. and another at 310 mμ. When a correction had been made for irrelevant absorption the distillate was calculated to have a potency of 1.7 "unit" per g. A further fraction from the original lard distillation had a biological value of 25 "units" per g.; it was subjected to the treatment described above and a spectral absorption curve typical of vitamin A was obtained. After correction for irrelevant absorption, a calculated value of 23.9 "units" per g. was obtained. When a sample of fresh lard was saponified and fractionated chromatographically, eluates were obtained which gave a spectral curve resembling that of vitamin A except for slight extraneous absorption in the region from 300 to 320 mμ. The potency calculated from the spectral curve after correction was 0.4 "unit" per g. lard.

R. J. Ward.

1710

LOWE, J. S. and MORTON, R. A. **Studies in vitamin A. 26. The vitamin A-replacing effect of lard.** *Biochem. J.*, 1953, **55**, 681-686. [Dept. Biochem., Univ. Liverpool.]

Chromatography of lard and its unsaponifiable matter failed to yield a fraction which would give a positive test for vitamin A or carotene by spectrophotometric examination in the ultraviolet or by the SbCl₃ test. A fraction obtained by molecular distillation of lard at from 210° to 220° C. was supplied in an amount of 0.6 g. daily in the diet of rats which had been depleted of vitamin A till they ceased to grow and had signs of xerophthalmia. Other depleted rats were given a diet containing arachis oil and a supplement of 6 I.U. vitamin A daily. Both groups grew rapidly and the eye lesions were completely cured. Analysis of the blood plasma, liver and kidneys failed to show the presence of vitamin A in the rats

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given lard distillate; the other rats had 52.3 I.U. per ml. in the plasma and 7 I.U. per g. in the kidney, but none in the liver. The average weight gain in 23 days was 41 g. for those given vitamin A and 39 g. for those given lard distillate.

R. J. Ward.

1711

LOWE, J. S., MORTON, R. A. and HARRISON, R. G. **Aspects of vitamin A deficiency in rats.** *Nature*, 1953, **172**, 716-719. [Dept. Biochem., Univ. Liverpool.]

The presence of traces of vitamin A and carotene in "light white casein", and the ability of light white casein to support slow growth in rats otherwise deficient in vitamin A, have been confirmed. Further evidence has been obtained that no vitamin A can be detected in the livers and other organs of rats subsisting on such low intakes, but normal amounts of rhodopsin were found in the retina. In confirmation of the claim of Kaunitz and Slanetz (Abst. 4883, Vol. 20), a distillate from lard was found to have slight biological activity, but no vitamin A or carotene could be detected by chemical methods. In spectroscopic studies of the unsaponifiable matter of the livers of rats deprived of vitamin A, a fraction was separated with absorption maxima at 275 and 332 $m\mu$. and with inflections at 233 and 283 $m\mu$. Similar absorption was seen in an extract of the tissues surrounding the eyes of rats with xerophthalmia. From the liver of an old, worn-out horse a fraction absorbing at 270 $m\mu$. was separated, and 3:5-cholestadiene-7-one was detected. From the spectroscopic studies it was inferred that vitamin A deficiency causes the appearance of abnormal metabolic products in the tissues, possibly by lifting the restraint on the dehydrogenation of cholesterol or steroid hormones. In histological studies of the adrenal glands of rats deprived of vitamin A, the distribution of lipids and cholesterol appeared to be normal, but phospholipins were reduced and confined to the *zona glomerulosa*.

T. Moore.

1712

ESH, G. C. and BHATTACHARYA, S. **Studies on the utilization of vitamin A. 3. Utilization of vitamin A palmitate.** *Indian J. Physiol. Allied Sci.*, 1953, **7**, 153-157. [Bengal Community Res. Inst., Calcutta.]

Weanling albino rats were depleted in vitamin A, and divided into groups of 6. Concentrates of vitamin A palmitate dispersed in arachis oil, ethyl oleate or an aqueous medium with Tween 20 or Tween 60 as dispersing agent were given to different groups of rats for 4 consecutive days at the rate of 720 I.U. vitamin A daily. The rats were rested on the fifth day and killed on the sixth when the livers were removed and vitamin A

was estimated in them. The percentage stored of the ingested vitamin A was 61.8 and 63.6 with the aqueous media, only 44.7 when the vitamin was given in arachis oil, and 34.7 when it was given in ethyl oleate. When the results were compared with those previously obtained (*Indian J. Physiol. Allied Sci.*, 1952, **6**, 43) for vitamin A acetate and vitamin A alcohol, the highest storage from all the media studied was found to be with vitamin A palmitate. When fortified with tocopherol as anti-oxidant, with lecithin or propyl gallate, significant increase in liver storage was obtained from arachis oil and ethyl oleate as solvents; thus, addition of tocopherol and lecithin together increased the percentage stored to 49.0 from 34.7 when ethyl oleate was used. No such increase occurred with the aqueous media. In a subsequent experiment smaller doses of from 10 to 34 I.U. vitamin A palmitate were given daily for 21 days and the solvent then had no significant influence on growth rate or liver storage and the results were almost identical with those for vitamin A acetate.—I. M. Sharman.

1713

JAMES, W. H. and ELGINDI, I. M. **The utilization of carotene. 1. As affected by certain proteins in the diet of growing albino rats.** *J. Nutrition*, 1953, **51**, 97-108. [Dept. Agric. Chem., Louisiana Agric. Exp. Stat., Baton Rouge.]

Male weanling rats which had been depleted of vitamin A were given a diet with casein or lactalbumin or gluten or zein and casein. The diets were equivalent in energy and protein and approximately equivalent in P. Each rat was given a daily dose of 21 μ g. β -carotene and 1 mg. α -tocopherol. They were weighed weekly and the food intake was recorded. Blood was taken for vitamin A analysis by the micromethod of Bessey *et al.* (Abst. 4004, Vol. 16) 4 and 8 hr. after the initial dose of carotene, 8 hr. after the second dose, 16 hr. after the third dose, and 16 to 20 hr. after the dose of carotene every 3 days subsequently. All the faeces were collected from each rat and analysed for carotene. After 6 weeks the rats were killed, and vitamin A was estimated in the liver.

The final average bodyweight of the 4 groups was 207, 198, 167 and 126 g., respectively. The vitamin A content of the liver was 69, 35, 41 and 12 μ g., respectively. The carotene excretion was 191, 282, 254 and 162 μ g. and the amount of carotene unaccounted for was 632, 572, 595 and 714 μ g., respectively. The value for vitamin A in the blood of the rats that received casein or lactalbumin was about 17 per cent. higher in the first 30 days than that of those that received gluten or casein and zein. After the 30th day no significant difference was found.—R. J. Ward.

1714

CHOU, T. C. and MARLATT, A. L. **Some factors in the Chinese diet affecting carotene utilization.** *J. Nutrition*, 1953, **51**, 305-315. [Dept. Foods Nutrit., Sch. Home Econ., Kansas State Coll., Manhattan.]

Male weanling rats of the Sprague Dawley strain were fed on a diet deficient in vitamin A until growth ceased and eye lesions appeared. During the following 4 weeks, groups of 6 were given supplements of carotene and were weighed; they were then killed and vitamin A was estimated in the serum and liver.

The first experiment, designed to test the efficiency of soya bean, groundnut and sesame oils as carriers for crystalline carotene, showed respective utilisation values of 1.00, 0.69 and 1.84 for the 3 oils. The superiority of sesame oil was at variance with the relative amount of tocopherol that it supplied, 11.5 mg. per kg. diet, compared with 27.5 μ g. for soya bean oil. Addition of 1 per cent. lecithin or 0.1 per cent. ascorbic acid to the diet containing 5 per cent. soya bean oil produced no significant synergistic effect when the average intake of carotene was 91 μ g. daily.

A second experiment used typical Chinese foods as sources of carotene and of fat, lecithin and ascorbic acid. To supply carotene, part of the Irish potato normally present in the diet was replaced by carrot, sweet potato, or the green leafy vegetable *woo-chei-pei*. The values for the utilisation of carotene from these sources did not differ significantly, and were between 35 and 67 per cent. of the utilisation value for crystalline carotene given in the soya bean oil diet.

I. M. Sharman.

1715

EVELETH, D. F., GOLDSBY, A. I., BOLIN, F. M. and BOLIN, D. W. **Effect of parasitism on conversion of carotene into vitamin A by sheep; a preliminary report.** *Vet. Med.*, 1953, **48**, 441-442. [Dept. Vet. Sci., N. Dakota Agric. Exp. Stat., Fargo.]

Two-year-old native grade sheep which had been kept from weaning on a ration low in carotene were used for the experiment. Of 4 animals, 1 was not infested with parasites; the others were given from 27,000 to 3,900,000 filariform larvae by stomach tube. After initial biopsy specimens had been taken each sheep was given, also by stomach tube, 60,000 "units" of carotene dispersed in water. After 16 hr. further biopsy specimens were taken from the non-infested and an infested sheep, and 2 hr. later from the remainder. All the sheep were slaughtered 40 hr. after they were given carotene.

The vitamin A content of the liver rose in the non-infested sheep from 5.1 to 14.4 I.U. per g.; the corresponding values for the infested sheep

were from 2.6 to 6.1, 2.7 to 1.6 and 3.4 to 6.2, showing that the non-infested sheep was more effective in converting the carotene supplied into vitamin A. There was, however, no correlation with the value for vitamin A in the serum.

I. M. Sharman.

1716

BIERI, J. G. and POLLARD, C. J. **The site of conversion of carotene injected into rats.** *Biochem. J.*, 1953, **55**, xxxi-xxxii. [Dept. Biochem. Nutrit., Univ. Texas, Galveston.]

1717

HARPER, T. A., BOUCHER, R. V. and CALLENBACH, E. W. **Vitamin A and survival of bobwhite quail.** *Pennsylvania Agric. Exp. Stat. Bull.* No. 567, June 1953, pp. 21. [State College, Pa.]

Experiments with 953 bobwhite quail, including 90 adults, are described. All chicks were fed on a basal diet low in vitamin A. In addition, all birds except those in a negative control group received a supplement of 3000 I.U. vitamin A per lb. diet. In the first experiment with pedigree chicks lasting for 16 weeks, the growth, mortality and storage of vitamin A were studied, and also the time of survival on a diet low in vitamin A and without food. Growth, liver weight and percentage mortality were about the same for 4 different strains, provided the supplement of vitamin A was given. In a second experiment 3 groups of chicks from parents selected as differing in ability to withstand a long winter period on the restricted diet were given an all-wheat depletion diet. Growth during a 16-week experimental period was about the same in the 3 groups. No significant difference in liver size or storage of vitamin A was found. Of 29 quail aged 16 weeks, none survived starvation for more than 89 hr. Of 88 birds, also aged 16 weeks, given the diet without vitamin A, 2 in a group of 33 survived 45 days and 2 in another group of 55 survived 37 days. In a third experiment the basal diet used in the first 2 experiments was confirmed as of low vitamin A content. One group of 100 quail were fed on the basal diet supplemented with 3000 I.U. vitamin A per lb. diet, and another group of 100 received the unsupplemented diet; of the latter 60 died from deficiency of vitamin A after 3 weeks and all died within 8 weeks.—I. M. Sharman.

1718

MILLEN, J. W., WOOLLAM, D. H. M. and LAMMING, G. E. **Hydrocephalus associated with deficiency of vitamin A.** *Lancet*, 1953, **265**, 1234-1236. [Dept. Anat., Univ. Cambridge.]

Hydrocephalus was found to be the cause of nervous disorders in young rabbits, aged from 2 to 8 weeks, from 5 does that had been deprived of

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vitamin A since 14 weeks before mating. It was caused by stenosis of the cerebral aqueduct. Paralysis and constriction of the optic nerve were secondary effects.—T. Moore.

1719

MEUNIER, P., ZWINGELSTEIN, G. and JOUANNEAU, J. Variations du taux des phénols urinaires au cours de la carence en vitamine A chez le rat. [Variation in the amount of phenols in the urine during vitamin A deficiency in the rat.] *Bull. Soc. Chim. biol.*, 1953, **35**, 1189-1191. [Lab. Chim. Biol., Fac. Sci., Lyons.]

Male albino rats were kept on a diet deficient in vitamin A until their growth had stopped. Others were given 2.5 μ g. vitamin A daily. Estimation of total phenols in the urine tended to give higher values for the deficient animals than for the non-deficient. In rats given vitamin A or deprived of it, administration of 1 mg. ascorbic acid daily tended to reduce the excretion of phenols.

T. Moore.

1720

LUDWIG, K. S. Vitamin A-Mangel und Überdosierung und ihre Beziehungen zum Gehalt an alkalischer Phosphatase der Epiphysenfuge. [Vitamin A deficiency and excess and their relations to the alkaline phosphatase content of epiphyseal cartilage.] *Internat. Ztschr. Vitaminforsch.*, 1953, **25**, 98-103. [Anat. Inst., Univ. Basle.] French and English summaries.

Weanling rats were kept for 6 weeks on a diet deficient in vitamin A, which was supplemented for some of them with adequate doses of the vitamin. Others were given, when two months old, the same diet with or without daily doses of 100,000 I.U. vitamin A for from 7 to 10 days. Deficiency of vitamin A was shown in the first group by cessation of growth, and vitamin A excess in the later groups by skeletal fractures. Sections of the bones were stained for alkaline phosphatase. In the distal epiphysis of the femur, the amount of phosphatase was decreased in deficiency and increased in excess. Much less intense phosphatase staining was found in the proximal epiphysis of the tibia after all treatments. Staining was most intense in the bones which had been fractured.—T. Moore.

1721

BRUSA, A. and TESTA, F. Lesioni nel sistema nervoso centrale di cavie in ipervitaminosi A. [Lesions of the central nervous system in guineapigs given excess of vitamin A.] *Internat. Ztschr. Vitaminforsch.*, 1953, **25**, 55-62. [Ist. Clin. Pediat., Univ. Genoa.] German, French and English summaries.

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Guineapigs weighing from 350 to 600 g., fed on a normal diet, were given a daily oral dose of from 300 to 600 I.U. vitamin A per g. bodyweight. They died in from 10 to 16 days. Portions of the central nervous system were fixed in formalin. Histological examination showed severe lesions in the cerebral cortex, cerebellum, thalamus and mesencephalon.—E. M. Hume.

1722

MADDOCK, C. L., COHEN, J. and WOLBACH, S. B. Effect of hypervitaminosis A on the testes of the rat. *Arch. Pathol.*, 1953, **56**, 333-340. [Div. Nutrit. Res., Child. Hosp., Boston, Mass.]

Male weanling rats were given a synthetic diet and, daily for 6 weeks or until they died, 250 I.U. vitamin A as palmitate per g. bodyweight. At autopsy degenerative changes were found in the testes; the spermatozoa were reduced in numbers, and chromatin was lost from the spermatids and spermatocytes. Later, sloughing of the spermatocytes and clumping of their nuclei and of those of the spermatids caused the formation of giant cells. Finally the germinal epithelium was almost completely sloughed away. The changes were thought to be non-specific and to resemble those produced by inanition.

The addition of α -tocopheryl acetate in massive doses of 10 or 100 mg. per 50 g. bodyweight intensified the injuries caused by vitamin A. The testes were severely injured also in rats given only vitamin A in conjunction with a stock diet. When the dose of vitamin A was reduced to 100 I.U. per g. bodyweight and was given for up to 100 days in conjunction with a synthetic diet, with or without tocopherol, the injuries to the testes were moderately severe. Only trifling changes occurred in the testes of rats which were allowed to become sexually mature before being given, for up to 7 weeks, 100 I.U. vitamin A per g. bodyweight, with a synthetic diet and with or without vitamin E. Haemorrhage, which was a common cause of death before the end of the intended period of treatment with vitamin A, occurred more often in rats given the synthetic diet than in those given the stock diet. The tendency to haemorrhage was intensified by tocopherol.—T. Moore.

1723

SIMIC, B. S., SINCLAIR, H. M. and LLOYD, B. B. The activity of ascorbic acid in hypervitaminosis-A in the guinea-pig. *Internat. Ztschr. Vitaminforsch.*, 1953, **25**, 7-20. [Lab. Human Nutrit., Univ. Oxford.] German and French summaries.

Young male guineapigs were fed on a pelleted diet deficient in vitamins A and C. The first group of 9 received an adequate daily intake of 20 mg.

ascorbic acid, and of 100 I.U. vitamin A. A second group of 11 received the same amount of ascorbic acid but excess of vitamin A, 40,000 I.U. The third group, also of 11, received the same excess of vitamin A and 500 mg. ascorbic acid. L-Tyrosine was given to the animals on certain days. On the 34th day all surviving animals were bled from the jugular vein for estimation of plasma ascorbic acid, and on the 41st day they were killed for estimation of ascorbic acid, tyrosine, vitamin A, protein and Hb in the blood and of ascorbic acid, tyrosine and vitamin A in the liver.

Average values for vitamin A in the liver of the three groups were 130, 8280 and 7500 I.U. per g., and for vitamin C in the plasma they were 0.310, 0.520 and 0.899 mg. per 100 ml., respectively. Both values were negatively correlated with the average value for tyrosyl in the liver, 76, 67 and 38 mg. tyrosine per 100 g. Excess of vitamin A appeared to interfere with general liver function and so to depress the catabolism of tyrosine in the liver. Signs of vitamin A intoxication appeared in the last two groups, and there was no evidence of any preventive effect of a high intake of ascorbic acid.—I. M. Sharman.

1724

BEARSE, G. E., McCLARY, C. F. and SAXENA, H. C. **Blood spot incidence and the vitamin A level of the diet.** *Poultry Sci.*, 1953, **32**, 888. *Proc. [W. Washington Exp. Stat., State Coll. Washington, Puyallup.]*

1725

ELLENBERGER, H. B., NEWLANDER, J. A. and JONES, C. H. **Effects of feeding different grades of hay and cod-liver oil concentrate to dairy cattle. 2. From 91 to 360 days of age.** *Vermont Agric. Exp. Stat. Bull.* No. 570, June 1953, pp. 88.

The trials were planned as tests of Ca and P requirements but were modified to show also whether calves given feeds ordinarily available are benefited by supplements of vitamins A and D. A previous report (Abst. 326, Vol. 22) covered the first 3 months of life; the present report covers the second, third and fourth 3-month periods. Intake, weight gain, blood analysis and several other sets of data for live and slaughtered animals are shown in tables, and comparisons are made with standard animals. The present Abstract is concerned only with the results relating to vitamins A and D.

The experiment, which lasted 12 years, was continued through 5 generations. A total of 61 heifer and 25 bull calves was divided into 4 groups, given good hay or poor hay with and without cod liver oil. The feed consisted of 3 parts each of maize meal, ground oats and wheat bran, and one part linseed meal with 1 per cent. salt. Each calf was allowed all it would eat of this mixture up to 4 lb. daily with chopped hay to appetite and grass clippings or silage when in season. The calves went outdoors for limited periods daily if weather permitted.

The average weight gain during the final 10-month period expressed as percentage of normal was for good hay 94, good hay and cod liver oil 99, poor hay 80, poor hay and cod liver oil 87, so that cod liver oil improved both hays, but good hay alone was better than poor hay with cod liver oil.—V. H. Booth.

1726

BISWAS, T. D., DAKSHINAMURTI, C. and DAS, N. B. **Studies on the carotene content of some green leafy vegetables.** *Indian J. Physiol. Allied Sci.*, 1953, **7**, 87-92. [*Indian Agric. Res. Inst., New Delhi.*]

The carotene content of leaves of 23 vegetables commonly eaten in India was estimated by a modern method. Jute leaves with 195 p.p.m. were the richest source.—V. H. Booth.

1727

PROTSEV, B. M. **Dinamika soderzhaniya karotina v kvashenoi i sushenoi morkovi. [Carotene content in fermented and dried carrots.]** *Gigiena Sanit.*, 1952, No. 10, 34-37.

Carrots were fermented by treating the pulped material with 4 to 5 per cent. solution of cooking salt, and the paste formed was kept at from 20° to 25° C. till foaming ceased. The fermented material was then stored at from 0° to 3° C. The carotene content decreased by from 30 to 32 per cent. on storing the fermented carrots for 11 months. Dried carrots contained per cent. from 10.5 to 16.5 mg. carotene, though about 65 per cent. of the carotene in the original sample was destroyed by the drying process. When the dried carrots were kept for 2½ months in the light but without access of air the amount of carotene decreased by from 10 to 11 per cent.; with access of light and air the decrease was from 16 to 19 per cent.—W. Hughes.

See also Absts. 1796, 2235.

VITAMIN D

1728

LEWIS, E. F. and BURROW, H. The effect of dihydrotachysterol on bovine blood calcium, inorganic phosphate and sugar levels. *Brit. Vet. J.*, 1953, **109**, 521-525. [Dept. Med., Royal Vet. Coll., Streatley.]

Intramuscular injection of dihydrotachysterol into 3 cows produced a consistent rise in the blood Ca value which was maintained for about 4 days. In one cow given the drug orally the response was similar but slower, and the effects were maintained for longer. The blood inorganic P value was depressed in all, but in 2 animals it eventually rose to a value higher than the initial one. The blood sugar value was generally raised, but the value for blood Mg appeared to be unaffected. It is suggested that dihydrotachysterol may prove of value in retarding the development of symptomatic hypocalcaemia, and in preventing the relapse of cases treated by ordinary methods, but the need for care is pointed out where the value for blood P is low. It is suggested also that the drug may prove useful for combating ketosis in normal pregnancy and parturition.—W. A. Greig.

1729

HANSSLER, H. Experimentelle Untersuchungen über die Beziehungen der Nebenschilddrüsen-morphologie und -Funktion zur Vitamin D-Wirkung. [Experimental studies on the relations between the morphology and function of the parathyroid glands and the action of vitamin D.] *Ztschr. ges. exp. Med.*, 1953, **121**, 209-227. [Kinderklin., Univ. Tübingen.]

A total of 124 rats from 4 to 5 weeks old, fed on a constant diet, were kept for 5 or 6 days in a dark room at 25° C. before being given parathyroid hormone or vitamin D for varying periods. They were killed fasting, and serum Ca and P were estimated, organs were fixed in formalin for histological examination, and statistically controlled measurements of the size of nuclei were made.

When 400 units of parathormone Lilly were given daily for 6 days, there was some increase of serum Ca and reduction of serum P, with diminution in size of the nuclei in the parathyroid gland. When vitamin D₂ or D₃, about 30 µg. daily mixed in the food, was given instead of parathormone for up to 13 days, the results were the same. Smaller doses, about 10 µg. daily, were effective also. An inverse relationship could be detected between the size of the parathyroid gland nuclei and the value for serum Ca. The state of the parathyroid gland in which the nuclei were small was taken to be one of rest, and histological examination of the thyroid

gland showed that its cells also entered into a state of rest in the same circumstances as the cells of the parathyroid gland.

The statistically controlled measurement of nuclei is recommended as a possible means of assessing the activity of glandular tissue.

E. M. Hume.

1730

GRANT, A. B. Carotene: a rachitogenic factor in green-feeds. *Nature*, 1953, **172**, 627. [Wallaceville Animal Res. Stat., Wellington, N.Z.]

When groups of 18 rats were given 0.075 or 0.15 I.U. vitamin D daily the average percentage ash in the dry, fat-free femur was 33.2 and 37.9, respectively. When the daily dose of 0.15 I.U. vitamin D was supplemented with 1.75, 3.5, 7.0, 14.0 or 28.0 mg. dried grass daily, which represented 1.2, 2.4, 4.8, 9.6 or 19.2 µg. carotene, the average percentage ash was 38.1, 36.3, 35.6, 32.9 and 31.6, respectively. When groups of 24 rats were given daily 0.05, 0.10 or 0.20 I.U. vitamin D only, the average percentage was 32.4, 34.3 and 38.7. When similar groups of rats were given 0.15 I.U. vitamin D and 0.781, 3.125, 12.5, 50.0 or 100.0 µg. carotene the average percentage ash was 34.9, 34.3, 32.6, 31.2 and 30.6, respectively. A daily dose of 50 I.U. vitamin A had a similar effect, and reduced the average percentage ash from 34.1 to 31.8.—R. J. Ward.

1731

TAUGNER, R. and FLECKENSTEIN, A. Kapillarabdichtung durch Ultraviolettstrahlung und Vitamin D. Versuche an weissen Ratten bei ernährungsbedingter und toxischer Kapillarschädigung. [Increase in capillary strength caused by ultraviolet irradiation and vitamin D. Experiments with white rats on capillary injury caused by diet and toxins.] *Ztschr. Vitamin-, Hormon- Fermentforsch.*, 1952-53, **5**, 89-97. [Pharmakol. Inst., Univ. Heidelberg.] English and French summaries.

Male white rats weighing from 150 to 200 g., maintained on a diet of maize only, showed after from 3 to 5 weeks fragility of the capillaries which was demonstrated by a negative-pressure method on the skin of the abdomen. Exposure to sunlight for a short time, 15 min. in St. Moritz (1800 m.) or 60 min. in Heidelberg, restored the capillary resistance to normal for about 3 days. The same effect was obtained with an ultraviolet ray lamp or intravenous injection of 10 µg. vitamin D₂ or D₃ per 100 g. bodyweight.

Capillary fragility induced with puff-adder venom gave doubtful results on treatment with vitamin D or ultraviolet light.—E. M. Hume.

1732

BUBNOFF, M. v. and TAUGNER, R. Sonnenbestrahlung und Kapillarabdichtung. Vergleichende Untersuchungen über die Stärke der kapillarabdichtenden Wirkung des Sonnenlichtes in Heidelberg, St. Moritz und auf der Corviglia. [Solar irradiation and increase in capillary resistance. Comparative investigation of the capillary-strengthening activity of sunlight in Heidelberg, in St. Moritz and on the Corviglia.] *Ztschr. Vitamin-, Hormon- Fermentforsch.*, 1952-53, **5**, 272-278. [Pharmakol. Inst., Univ. Heidelberg.] French and English summaries.

Capillary resistance was measured as described (see preceding Abst.) with groups of from 8 to 12 rats before and after exposure to ultraviolet light or intravenous injection of vitamin D in water-soluble form. Tissue permeability was measured by the rate of disappearance of methylene blue or fluorescein injected into the shaved abdominal skin.

The same effect was produced by exposure with a clear sky to sunlight for 30 min. at Heidelberg (120 m.) or 15 min. at St. Moritz (1800 m.) or 5 min. on the Corviglia (2450 m.), or to a quartz mercury vapour lamp for 10 min. Somewhat weaker was the effect of injecting 10 μ g. vitamin D₂. A stay on the Corviglia without exposure to sun had no effect.

Absorption of fluorescein and methylene blue was retarded by the exposures but the results did not run quite parallel to those for capillary resistance.—E. M. Hume.

1733

KLUNGSÖYR, L. and PIHL, A. The alleged effect of vitamin D on skin respiration. *Acta physiol. scand.*, 1953, **29**, 377-380. [Nutrit. Res. Inst., Univ. Oslo.]

Two groups of rats of about 50 g. weight received a rachitogenic diet of, per cent., egg albumin 5, wheat flour of 75 per cent. extraction 88.8, dried brewer's yeast 2, CaCO₃ 2, NaCl 2, and FeCl₃ 0.2. Spinach was added, 0.5 kg. per 2 kg. diet. One group received in addition 1.5 I.U. vitamin D as cod liver oil. Another group received the same diet but with CaHPO₄ instead of CaCO₃ and no cod liver oil. After 16 days, X-ray examination showed florid rickets in the group on the first diet without cod liver oil, and normal calcification in the other 2 groups. Rats were killed after 16 and 19 days on the diets. On skin from those with unequivocal X-ray evidence of rickets, the O₂ consumption was measured in a Warburg apparatus, but no significant difference was found between the groups.—E. M. Hume.

1734

FEASTER, J. P., SHIRLEY, R. L., MCCALL, J. T. and DAVIS, G. K. ³²P distribution and excretion in rats fed vitamin D-free and low phosphorus diets. *J. Nutrition*, 1953, **51**, 381-392. [Nutrit. Lab., Agric. Exp. Stat., Univ. Florida, Gainesville.]

Weanling rats in groups of 44 were given a synthetic diet containing, per cent., Ca 0.4 and P 0.014. One group received 11.13 g. NaH₂PO₄, one group 3000 U.S.P.U. vitamin D₂, and one both per kg. ration. The Ca to P ratios were 28 : 1 and 1.6 : 1. After 10 days all the rats were given a dose of ³²P as inorganic phosphate by mouth or by intramuscular injection. Rats were killed subsequently after 15 min., 5 and 24 hr. and 4, 8, 14, 16 and 21 days. Total P and ³²P were estimated in the blood, tissues, urine and faeces.

The amount of total P in the liver, kidneys and muscle did not differ significantly in the 3 groups, being apparently maintained on the low-P diet at the expense of bone; in the femur it diminished steadily in the rats having the low-P diet and no vitamin D, but in the others it was maintained. Rate of deposition and turnover of ³²P in the femur was almost the same on all diets after oral administration, but after intramuscular injection it was throughout at a much lower level with the low-P diet. In muscle, liver, kidney and blood, the deposition of ³²P was greater after intramuscular administration; it was always higher with the low-P diet than with the other two, for which the results were nearly the same. In the urine of the rats on the low-P diet, the values for ³²P were about one-tenth those for the rats on the adequate-P diet. There was no evidence of any effect of vitamin D on the behaviour of the urinary or faecal P.

In older rats treated in the same way, radioautographs showed deposition of very little ³²P in the proximal end of the femur with the low-P diet compared with the others.—E. M. Hume.

1735

CLAASSEN, V. and WÖSTMANN, B. S. J. The uptake of injected radioactive phosphorus in the skeleton of the growing white rat. 1. The uptake of intravenously injected ³²P by rachitic and control animals during the first 24 hours. *Biochim. biophys. Acta*, 1953, **12**, 432-438. [Lab. Physiol. Chem., Municipal Univ., Amsterdam.] French and German summaries.

Rats were maintained from weaning on a modification of Steenbock and Black's rachitogenic diet containing, per cent., Ca 1.2 and P 0.3 with or without 14 I.U. vitamin D₂ given orally three times weekly. After 3 weeks they were given injections into the femoral vein of ³²P as NaH₂PO₄ and were killed at intervals of from 5 min. to 24 hr.

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afterwards. Inorganic P and ^{32}P were estimated in the blood plasma and in the femur. Radioactive P could be detected in the femur of the rachitic and non-rachitic rats to about the same extent within 5 min. After 15 min. the uptake in the non-rachitic rats was the greater and it remained so to the end of the 24 hr.

It is considered that the initial uptake is by exchange and is comparable for rachitic and non-rachitic animals. Subsequently the incorporation of ^{32}P into bone is by deposition from the bloodstream, which occurs more actively in non-rachitic rats.—E. M. Hume.

1736

KIVENKO, S. and TITOV, A. Obogashchenie moloka vitaminom D. [Vitamin D enrichment of milk.] *Mol. Prom.*, 1953, 14, No. 8, 30-33. [Vses. Nauch.-Issled. Inst. Mol. Prom.]

A solution of irradiated ergosterol in refined vegetable oil was added to milk in the proportion of 1000 I.U. vitamin D to 1 litre. To obviate the difficulty of uneven distribution vitamin D was introduced in two steps. A concentrated emulsion of the solution of vitamin D, 154,000 I.U. per ml., was made with a small quantity of milk to form a basic mixture, and was added to the bulk milk which was then pasteurised, cooled and bottled. The same method was applied to dried milk. Basic mixtures prepared with condensed sterilised milk, with or without sugar could be used in schools and households for introducing vitamin D.

E. W. Birse.

VITAMIN E

1737

NOBILE, S. and MOOR, H. Analysenmethode zur Bestimmung des Vitamins E in Lebens- und Futtermitteln. (Kolorimetrische Bestimmung nach Emmerie-Engel.) [Estimation of vitamin E in foods and feedingstuffs. Colorimetric estimation by the method of Emmerie and Engel.] *Mitt. Geb. Lebensmittel. Hyg.*, 1953, 44, 396-402. [Hoffmann La Roche Co., Basle.] French and English summaries.

The material under examination was minced, pulverised or homogenised, and heated with methanolic potash in the presence of Na ascorbate as a protective agent. Another portion of the same material was treated in the same way, but with addition of tocopherol as an internal standard. The unsaponifiable residues were extracted with light petroleum, and the vitamin E fraction was separated by chromatography on alumina for treatment with the FeCl_3 and $\alpha\alpha'$ -dipyridyl reagents. For milk and milk products the procedure was modified by including a preliminary extraction of the fat according to the Röse Gottlieb method.—T. Moore.

1738

TAPPEL, A. L. The inhibition of hematin-catalyzed oxidations by α -tocopherol. *Arch. Biochem. Biophys.*, 1953, 47, 223-225. [Dept. Food Technol., Univ. California, Davis.]

The oxidation of colloidal linoleate in phosphate buffer, catalysed by haemoglobin or cytochrome c, was inhibited completely by α -tocopherol, *nor*-dihydroguaiaretic acid, propyl gallate or butylated hydroxyanisole. The inhibition by α -tocopherol of the co-oxidation of vitamin A and carotene with unsaturated fatty acids in emulsion systems with haemin was estimated by manometric oxygen absorption and spectrophotometry. The greater

the amount of tocopherol present, the greater was the protection of vitamin A and carotene.

R. J. Ward.

1739

MECCHI, E. P., POOL, M. F. and KLOSE, A. A. The role of tocopherol content in the stability of chicken and turkey fats. *Poultry Sci.*, 1953, 32, 915-916. *Proc.* [W. Reg. Res. Lab., Bur. Agric. Indust. Chem., U.S. Dept. Agric., Albany, Calif.]

1740

DAM, H. Vitamin E as an in vivo antioxidant. *Gegenwartspröbleme der Ernährungsforschung, Symposium, Basle*, October 1952. Verlag Birkhäuser, Basle, 1953. Price Swiss fr. 32. [Dept. Biochem. Nutrit., Polytech. Inst., Copenhagen.]

1741

SINGSEN, E. P., MATTERSON, L. D., KOZEFF, A., BUNNELL, R. H. and JUNGHER, E. L. Studies on encephalomalacia in the chick. 1. The influence of a vitamin E deficiency on the performance of breeding hens and their chicks.

SINGSEN, E. P., BUNNELL, R. H., KOZEFF, A., MATTERSON, L. D. and JUNGHER, E. L. 2. The protective action of diphenyl-p-phenylenediamine against encephalomalacia. *Poultry Sci.*, 1953, 32, 925; 924-925. *Proc.* [Storrs Agric. Exp. Stat., Univ. Connecticut.]

1742

JENSEN, L. S., HEUSER, G. F., SCOTT, M. L. and NORRIS, L. C. The effect of vitamin E and niacin in the nutrition of turkey breeder hens. *Poultry Sci.*, 1953, 32, 907. *Proc.* [Cornell Univ., Ithaca, N.Y.]

1743

McLEAN, J. R. and BEVERIDGE, J. M. R. **The prevention of liver necrosis by alpha-tocopherol, methionine, and cysteine by oral and parenteral routes.** *Canad. J. Med. Sci.*, 1953, **31**, 417-420. [Dept. Biochem., Queen's Univ., Kingston, Ont.]

Groups of 10 male rats of weight 55 g. were given a basal diet with or without daily supplements of 16 mg. DL-methionine, 40.3 mg. L-cysteine or 4.5 mg. α -tocopherol. The same amount of supplement as was given in the daily ration was administered by injection daily to other groups. The experiment was terminated after 105 days and the livers of the surviving rats were examined for necrosis. All the rats receiving no supplement died of liver necrosis in 39 days on the average. Of the rats which received methionine orally, 4 died, and of those which received it parenterally 7 died, after average periods of 70 and 61 days, respectively. Similarly, of those which received cysteine by mouth 7 died and of those which received it parenterally 8 out of 8 died, after average periods of 61 and 71 days, respectively. α -Tocopherol gave complete protection against liver necrosis whether given orally or parenterally.

R. J. Ward.

1744

BLAXTER, K. L. and SHARMAN, G. A. M. **Prevention and cure of enzootic muscular dystrophy in beef cattle.** *Nature*, 1953, **172**, 1006-1007. [Hannah Dairy Res. Inst., Kirkhill, Ayr.]

Enzootic muscular dystrophy has been reported in suckling beef calves on from 15 to 25 per cent. of the farms in Inverness-shire that rear beef cattle. Sometimes 90 per cent. of the calves on a farm were affected. Observations were made on 4 groups of calves, each of 42 animals, which were spread over 20 farms. On each farm half the cows were given α -tocopheryl acetate before calving and half were not. The calves born in each group were again subdivided, half receiving the vitamin and half not. In the calves whose dams received no tocopherol, and which themselves were given no tocopherol after birth, there were 11 cases of dystrophy, of which 3 were fatal. Only 3 of the calves treated after birth were affected. Among the calves whose dams were treated, but which were not themselves treated, only 2 cases of dystrophy occurred, and there were none when calves were treated also after birth. If dystrophic calves were treated promptly with tocopherol they always recovered completely. Chemical estimation of tocopherol in the serum of calves born on farms where the disease was severe gave values of only 40 μ g. per 100 ml., compared with 150 μ g. in normal healthy calves in Ayrshire. The disease occurred almost always in calves born indoors in

spring to dams which had been housed since the previous autumn.—T. Moore.

1745

BLAXTER, K. L., BROWN, F. and MACDONALD, A. M. **The nutrition of the young Ayrshire calf. 13. The toxicity of the unsaturated acids of cod-liver oil.**

BLAXTER, K. L., BROWN, F., WOOD, W. A. and MACDONALD, A. M. **14. Some effects of natural and synthetic anti-oxidants on the incidence of muscular dystrophy induced by cod-liver oil.** *Brit. J. Nutrition*, 1953, **7**, 287-298; 337-349. [Hannah Dairy Res. Inst., Kirkhill, Ayr.]

13. Calves were given a basal diet of dried skimmed milk with a supplement of 2.5 mg. α -tocopheryl acetate daily to all except one. To the diet was added whole cod liver oil, or the unsaponifiable residue of it, or the saturated acids, or the unsaturated acids together, or the less unsaturated and the highly unsaturated acids separately. Four of the calves were given capsules of halibut liver oil.

The calves which were given whole cod liver oil or the total unsaturated acids developed severe muscular dystrophy. Slight dystrophy occurred with the highly unsaturated acids. The non-saponifiable residue and the saturated fatty acids had no effect. With the less unsaturated acids the calves did not develop dystrophy, but their musculature was pale. Muscles of both dystrophic and normal calves contained about the same amount of total tocopherols. Dystrophic muscles contained as much or even more tocopherol than contiguous, apparently normal muscles of the same animal. The mean creatine content of muscles of calves receiving whole cod liver oil, total unsaturated acids or highly saturated acids was less than of the animals given halibut liver oil. The experimental diets had little effect on the tocopherol content of other tissues. Peroxides could not be detected in lipids extracted from the tissues.

14. Calves were given a basal diet of dried skimmed milk and 1 fluid oz. cod liver oil daily with supplements of 200 mg. α -tocopheryl acetate daily by mouth, 400 mg. α -tocopheryl acetate every second day by intramuscular injection, 1.6 g. ascorbic acid daily by mouth in a single dose, 1.6 g. ascorbic acid daily by mouth in 2 doses, 3.2 g. ascorbic acid daily by intravenous injection, 0.4 mg. biotin daily by subcutaneous injection, 2.0 g. ethyl gallate daily by mouth or 1.0 g. methylene blue daily by mouth. Each animal received the equivalent of 7.5 mg. α -tocopherol from the cod liver oil and skimmed milk.

Muscular dystrophy was completely prevented by α -tocopheryl acetate given orally and by methylene blue. Considerable protection was given by α -tocopheryl acetate when injected, and

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slight protection by ascorbic acid. Ethyl gallate and biotin provided no protection. The tocopherol content of the blood serum of the calves receiving cod liver oil and tocopherol by mouth rose rapidly from an initial value of 200 $\mu\text{g.}$ per 100 ml. to about 400, after which it remained fairly constant. The serum tocopherol of calves receiving tocopherol by injection fell rapidly to zero. Ascorbic acid given by mouth or injected had no effect on the rate of disappearance of tocopherol from the blood. There was no difference in the serum values between calves receiving cod liver oil alone, and those receiving ethyl gallate or methylene blue as well. Little difference was found in the tocopherol content of the tissues of calves receiving the several supplements. The value for serum tocopherol of the calves at the beginning of the experiment was closely correlated with the amount of colostrum they had been given, judged by the content of colostral globulins in the blood.

R. J. Ward.

1746

BLAXTER, K. L. **Muscular dystrophy.** *Vet. Rec.*, 1953, **65**, 835-837 (with discussion 837-838). [Hannah Dairy Res. Inst., Kirkhill, Ayr.]

1747

NIELSEN, J., FISKE, A. N., PEDERSEN, A. H., PRANGE, I., SØNDERGAARD, E. and DAM, H. **The influence of feeding tocopherol to dairy cows on the yield of milk and milk-fat and on the tocopherol content and keeping quality of the butter.** *J. Dairy Res.*, 1953, **20**, 333-339. [Nat. Res. Inst. Animal Husb., Copenhagen.]

Cows in 2 groups of 9 were given a basal ration for 42 days. One group received a daily supplement of 2 g. α -tocopheryl acetate for the next 63 days and the other received only the basal ration. Both groups were then given the ration without supplement for a further 35 days.

The yield of milk and the percentage of fat in the milk were not affected by the tocopherol supplement. The butter produced from the milk

was assessed for quality and the peroxide number was estimated. After 14 days at 13° C. the butter from the milk of the cows receiving the supplement had an oily flavour and a peroxide value of 0.4 compared with 0.1 for butter from the milk of the cows receiving no supplementation.

In a second experiment when the 3 periods were of 35 days each, there was little difference in flavour and peroxide value. In the experimental period the tocopherol content of the butter rose from 10 to 12 $\mu\text{g.}$ per g. in the group without supplement to from 23 to 26 $\mu\text{g.}$ per g. in the group with supplement. Tocopherol supplementation did not result in an increase in the vitamin A and carotene content of the butter. Butterfat from the group without supplement was incorporated in a diet producing encephalomalacia in chicks; encephalomalacia did not develop, but the tocopherol content was insufficient to prevent white striation of the breast muscles.—T. Moore.

1748

PIANA, C. La mesoinosite potenzia l'azione mastoplastica della vitamina E? [**Meso-inositol as activator of the effect of vitamin E on the mammary gland.**] *Zootec. Vet.* 1953, **11**, 337-343. [Staz. Sper. Zootec., Univ. Milan.] English summary.

Virgin, castrated guineapigs were divided into 4 groups of 5 each. All received the same basal diet, and 3 groups were given, in addition per head daily, 10 or 20 mg. α -tocopherol or 10 mg. α -tocopherol with 20 mg. meso-inositol. The treatment began 20 days after castration. The animals were killed after 110 days, and the mammary tissue was examined histologically. Mammary development occurred in all 3 treated groups, and was greatest in the group given 20 mg. tocopherol alone. The effects in the other 2 treated groups were comparable. It was concluded that in the conditions of the experiment meso-inositol did not affect the action of high doses of vitamin E in stimulating mammary development.—T. D. Bell.

VITAMIN K

1749

CANDELLI, A. and POLITO, E. Ricerche sul meccanismo dell'azione antibatterica della vitamina K. [**Mechanism of the antibacterial action of vitamin K.**] *Boll. Soc. ital. Biol. sper.*, 1953, **29**, 287-290. [Ist. Igiene, Univ. Perugia.]

Of the bisulphite and disulphonate of vitamin K, 2-methyl-1:4-naphthaquinone, both water-soluble, the former contains the quinone ring but the latter does not. The oxidation-reduction potential and the bacteriostatic action against *Sarcina rosea*, *Streptococcus pyogenes* and *Neisseria sicca* were estimated for the two salts. The disulphonate had the higher oxidation-reduction potential, but the

bisulphite was active in a concentration of 1 in 50,000 against the first 2 organisms and of 1 in 10,000 against the third, while the disulphonate was without activity in a concentration of 1 in 250 against any of them.—E. M. Hume.

1750

HARE, J. H., ANDERSON, G. C. and WEAKLEY, C. E. (Jr.) and BLETNER, J. K. **Factors contributing to a hemorrhagic condition in experimental chicks fed simplified rations.** *Poultry Sci.*, 1953, **32**, 904-905. *Proc.* [W. Virginia Agric. Exp. Stat., Morgantown.]

VITAMIN B COMPLEX : GENERAL

1751

HEYNDRIKX, A. Paper chromatography of choline and the vitamins B₁, B₂, niacin and niacinamide. Preparation of radioactive choline acetate and study of its hydrolysis. *J. Amer. Pharm. Assoc.*, 1953, **42**, 680-681. [Coll. Pharm., Univ. Minnesota.]

A qualitative separation of these compounds was made with *n*-propyl alcohol hydrochloric acid as solvent in paper chromatography and a solution of 0.05 N NaOH as spray.

Radio-active choline acetate was prepared and its hydrolysis was studied. After 24 hr. exposure to the atmosphere 54 per cent. of it was hydrolysed and after 3 days nearly 61 per cent. It was completely hydrolysed after a few seconds in an aqueous medium.—K. H. Coward.

1752

SNELL, E. E. Summary of known metabolic functions of nicotinic acid, riboflavin and vitamin B₆. *Physiol. Rev.*, 1953, **33**, 509-524. [Biochem. Inst., Univ. Texas, Austin.]

1753

AFONSKY, D. A. Lingual lesions in experimental niacin and riboflavin deficiencies in dogs. *J. Dent. Res.*, 1953, **32**, 633-634. *Proc.* [Sch. Med., Univ. Rochester, N.Y.]

1754

DHYSE, F. G., FISHER, G. R., TULLNER, W. W. and HERTZ, R. Liver vitamin content and adrenal cortical function. *Endocrinology*, 1953, **53**, 447-450. [Nat. Cancer Inst., Bethesda, Md.]

Rats from which the adrenal glands had been removed were kept on a high-protein synthetic diet for 5 days. Food was then removed and 17 hr. later they received in successive small intraperitoneal injections a total of 250 mg. glucose alone or with 3 mg. cortisone acetate. One hour after the last injection the animals were killed and samples of liver were removed for estimation of glycogen and members of the vitamin B complex. Injection of cortisone with the glucose increased the liver content of glycogen to about 3 times the value when glucose alone was injected. The values for biotin, nicotinic acid, pantothenic acid, riboflavin, pyridoxine and folic acid in the liver were not substantially affected by adrenalectomy or by injection of cortisone.—W. Godden.

1755

MONTANARI, L. and MARCHETTI, M. Eliminazione urinaria di B₁ e B₂ nel ratto ipofisectomizzato. [Elimination of vitamin B₁ and riboflavin in the urine of hypophysectomised rats.] *Boll.*

Soc. ital. Biol. sper., 1953, **29**, 320-322. [Ist. Chim. Biol., Univ. Bologna.]

In rats weighing from 120 to 150 g., maintained on a complete diet, the amount of vitamin B₁ and of riboflavin eliminated in the urine, in mg. per 24 hr., ranged, respectively, from 0.214 to 0.375 and from 1.655 to 2.830. The corresponding values for rats after hypophysectomy were from 0.540 to 1.520 and from 2.420 to 9.120. The hypophysectomised rats ate, if anything, rather less than the normal rats.—E. M. Hume.

1756

HILL, D. C. and BRANTON, H. D. Failure of vitamin supplementation to improve growth on diets high in raw soybeans. *Poultry Sci.*, 1953, **32**, 882. [Dept. Nutrit., Ontario Agric. Coll., Guelph.]

Male Columbian Rock chicks which had received a commercial ration for 14 days were given a basal diet containing 50.75 per cent. of raw soya beans, with alfalfa meal, cerelose, minerals and an adequate vitamin mixture, supplemented with individual vitamins one at a time in amounts 20 times as great as the allowances recommended by the National Research Council. In no instance was growth improved; it was in fact depressed by pyridoxine, nicotinic acid or vitamin B₁₂. Addition of 1.365 g. DL-methionine per lb. basal diet significantly increased growth.

E. M. Cruickshank.

1757

JACOBS, R. L., ELAM, J. F., QUISENBERRY, J. H. and COUCH, J. R. Dehydrated alfalfa leaf meal as a source of vitamins and unidentified factors for the mature fowl. *Poultry Sci.*, 1953, **32**, 812-816. [Dept. Biochem., Agric. Exp. Stat., College Station, Tex.]

White Leghorn pullets were given a diet of plant products with or without supplements of vitamin B₁₂ or alfalfa or both. Pantothenic acid, vitamin B₁₂ and citrovorum factor were estimated microbiologically in the egg yolks, and the clotting time of the blood was measured in day-old chicks from hens on the experimental diets. The hatching capacity of the eggs was increased by supplements of vitamin B₁₂, and was further increased when alfalfa was given in addition. Alfalfa alone aggravated the signs of vitamin B₁₂ deficiency and did not improve the hatching capacity of the eggs, but did increase the percentage of fertile eggs. Supplements of alfalfa meal raised the content of folic acid and citrovorum factor in the eggs, but did not affect the content of pantothenic acid and vitamin B₁₂. The clotting time of the chicks' blood was much reduced when alfalfa meal was added to the hens' basal diet.—E. M. Cruickshank.

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1758

WILCOX, A. C., MILLER, B. S. and MILNER, M. **Growth-promoting substances in white sugars from different sources of manufacture and their effect on fermentation.** *Cereal Chem.*, 1953, **30**, 427-434. [Dept. Flour and Feed Milling Indust., Kansas State Coll.]

Microbiological estimations with *Leuconostoc mesenteroides* of vitamins B₁ and B₆, nicotinic and pantothenic acids and biotin showed the presence of small amounts in dextrose from maize and in sucrose from sugar beet but not in sucrose from cane.

The effect of these sugars on the aerobic and anaerobic respiration of compressed baker's yeast was estimated manometrically. Sugars containing vitamins increased CO₂ production during anaerobic respiration, although the amounts present were insufficient or the number was incomplete for maximum production. Comparable effects were found in aerobic respiration. The sugars had no appreciable effect on the rate of fermentation of bread dough by the yeast.—V. R. Jackson.

1759

ADRIAN, J. Teneurs de l'oeuf de poule en riboflavine, niacine et acide pantothenique. Variabilité et corrélations. [The riboflavin, nicotinic acid and pantothenic acid content of hen's eggs. Variations and correlations.] *Ann. Agronom.*, 1952, 1952, No. 3, 17-29. [Lab. Biochim. Nutrit., C.N.R.S., Bellevue.]

Estimations were made of riboflavin, nicotinic and pantothenic acids in hen eggs from a commercial source from April to mid-May, and in eggs from Rhode Island Red hens in batteries receiving for 3 weeks a controlled diet from about mid-June to mid-July. The eggs were plunged into boiling water and cooked for 10 min. before the estimations were made.

In the commercial eggs, the whole egg contained 4.6 µg. riboflavin per g., the ratio of the percentage in the yolk to that in the white being 1. Corresponding values for pantothenic acid were 19.8 and 4.6, and for nicotinic acid 0.6 and 0.39. Small eggs contained relatively more riboflavin and pantothenic acid than large eggs, but there was little difference in nicotinic acid concentration.

Hens under controlled conditions produced from 1 to 10 eggs each during the test; there was considerable variation in the vitamin content of both yolks and whites and of the ratios from hen to hen. The content of riboflavin and pantothenic acid in the yolks of the eggs was fairly constant in the eggs from any one hen, but the amount in the whites decreased as more eggs were laid. No similar observation was made for nicotinic acid. The average weight of the eggs was 46 g.; the contents in µg. per g. were riboflavin 4.4, nicotinic acid 0.6 and pantothenic acid 26.5; in the com-

mercial eggs riboflavin was slightly more concentrated in the yolks; the ratios for the other vitamins were the same as in the commercial eggs. Of the amount ingested by the birds, the percentage in the eggs was 11.4 for riboflavin, 0.065 for nicotinic acid and 25.2 for pantothenic acid.

V. R. Jackson.

1760

FREY, K. J. **Effects of variety and location on thiamine, pantothenic acid, riboflavin, and niacin contents in oats.** *Quart. Bull. Michigan Agric. Exp. Stat.*, 1953, **36**, 13-17. [Dept. Farm Crops.]

Estimations were made of vitamin B₁, riboflavin, pantothenic acid and nicotinic acid in 5 varieties of oats grown in 4 locations in Michigan in 1949. Variety and location affected vitamin B₁ values significantly, differences with location amounting to 35 per cent. of the lowest value and with variety to 20 per cent. Similar differences were found for pantothenic acid values. Variety but not location caused significant differences in nicotinic acid values. For these 3 constituents the same varieties had the highest and the lowest contents. Differences between varieties and locations caused small though significant variations in riboflavin content. Environmental factors appeared to be additive and to affect all varieties in the same way.—V. R. Jackson.

1761

CLEGG, K. M. and LEWIS, S. E. **The vitamin-B content of foodstuffs fumigated with methyl bromide.** *J. Sci. Food Agric.*, 1953, **4**, 548-552. [Dunn Nutrit. Lab., Univ. Cambridge.]

Fifteen ml. of a solution containing 1 mg. per ml. of nicotinic acid, nicotinamide or vitamin B₁ in phosphate buffer at pH 7 was treated with 1900 mg. methyl bromide per litre for an hour at 25° C. and then with N₂ for an hour. Estimations were made of nicotinic acid by colorimetric, microbiological and fluorimetric methods and of vitamin B₁ by the thiochrome method. There was no significant loss of nicotinic acid or vitamin B₁, but a small significant loss of nicotinamide estimated by the colorimetric method but not by the other 2 methods. Ionisable bromide was found in the nicotinic acid and amide solutions but not in that of vitamin B₁.

Samples of milled wheat with different moisture contents were treated with methyl bromide at concentrations considerably in excess of those used in commercial practice, and then with N₂. There was no loss of nicotinic acid or amide, vitamin B₁ or riboflavin, except of the last in one sample.

There was no significant loss of nicotinic acid, riboflavin or vitamin B₁ from whole wheat, rice, barley, maize, groundnuts, peas or beans after treatment with methyl bromide.—V. R. Jackson.

VITAMIN B₁ (ANEURIN, THIAMINE)

1762

KIESSLING, K. H. and LINDAHL, G. **Paper chromatographic separation of thiamine and its phosphate esters.** *Ark. Kemi*, 1953, **6**, 271-272. [Inst. Zoophysiol., Univ. Upsala.]

Vitamin B₁ and its mono-, di-, and triphosphates were separated by paper chromatography. A solution was obtained in *n*-butyl alcohol saturated with water and containing 18 per cent. formic acid. With the descending technique on Whatman No. 1 paper, washed with 4 *N* HCl and oxine, the spots separated well when synthetic material was used. The spots were made visible by spraying with K ferricyanide in alkaline solution.—R. Marshall.

1763

PLETICHA, R. **Oszillographisch - polarographisches Studium des Vitamin B₁ in alkalischer Lösung. [Oscillographic - polarographic study of vitamin B₁ in alkaline solution.]** *Pharm. Zentralhalle*, 1953, **92**, 395-402; 435-439.

1764

SHKODIN, A. M. and TIKHOMIROVA, G. P. **K polarografi tiamina. [Contribution to the polarography of vitamin B₁.]** *Biokhimiya*, 1953, **18**, 184-187. [Ukrain. Nauch.-Issled. Inst. Pishchevod. Prom., Kharkov.]

Vitamin B₁ could be estimated polarographically with 0.1 *N* KCl in water as a base electrolyte, a dropping mercury cathode and a saturated calomel anode. Preliminary experiments showed that E₂ became more negative with increasing pH from -1.25 at pH 6 to -1.35 at pH 8.5; in 50 per cent. aqueous ethanol solution E₂ was displaced positively from -1.25 to -1.125; E₂ was -1.36 in a 70 per cent. acetone and water medium. The method could be used to estimate vitamin B₁ in substances such as sugars containing only that vitamin, or in products containing other vitamins, including vitamins A, C and D and riboflavin, nicotinic acid and nicotinamide. Vitamin C was first oxidised with permanganate. The method of additions was used. Concentrations of 10⁻³ to 10⁻⁵ *M* could be determined.—W. Hughes.

1765

BOUMAN, J. **A new method for the determination of thiamine in urine.** *Internat. Ztschr. Vitaminforsch.*, 1953, **25**, 83-85. [Lab. Physiol. Chem., Nederlands Inst. Volksvoeding, Amsterdam.] German and French summaries.

Interference by the factor F₂ in the estimation in urine of vitamin B₁ as thiochrome was eliminated by oxidation of the urine in acid solution with K ferricyanide, removal of excess ferricyanide with ascorbic acid and extraction with *isobutanol* in

acid solution, followed by the usual method for oxidation of vitamin B₁ to thiochrome. More K ferricyanide was needed than for oxidation to thiochrome only. It is claimed that complete elimination of the interfering substance was obtained.—V. R. Jackson.

1766

FARRER, K. T. H. and HOLLENBERG, W. C. J. **Adsorption of thiamine on glassware.** *Analyst*, 1953, **78**, 730-731. [Kraft Foods, Ltd., Melbourne.]

Thirty ml. of a solution containing 0.1 µg. vitamin B₁ per ml. were swirled for 20 sec. in a number of similar glass vessels in succession. The vessels included flasks and cylinders, stoppered or calibrated, some new and some in constant use. Vitamin B₁ was estimated by the thiochrome method.

Percentage loss of vitamin B₁ ranged from 21 after passage through 5 calibrated 250 ml. flasks to 44 after passage through 6 stoppered flasks of 25 ml. capacity. Washing the glassware with alkaline ferricyanide resulted in recovery of 75 per cent. of the vitamin B₁ lost, showing that most of the loss was by adsorption on the glass. Thiochrome was not adsorbed on glass, nor was vitamin B₁ in highly acid solutions of the pure vitamin or of yeast extract.

Bird's procedure (*N.Z. J. Sci. Technol.*, 1949, **30**, 344) of washing glass with alkali every 3 months is recommended for preventing loss. It prevented also the removal from the glass of fluorescent material other than thiochrome by the mixture of ethanol and butanol used in the thiochrome method.—V. R. Jackson.

1767

REED, L. J. **Metabolic functions of thiamine and lipoic acid.** *Physiol. Rev.*, 1953, **33**, 544-559. [Biochem. Inst., Univ. Texas, Austin.]

1768

FERRARI, G. **Comportamento del piruvato del sangue nella ipoalimentazione. [Behaviour of blood pyruvate in undernutrition.]** *Boll. Soc. ital. Biol. sper.*, 1953, **29**, 290-292. [Ist. Fisiol., Univ. Pavia.]

Experiments with rats weighing from 55 to 65 g., deprived and not deprived of vitamin B₁ and some of them subjected to paired feeding, showed that only deprivation of vitamin B₁ had any effect in causing a rise of blood pyruvic acid; the values in mg. per 100 g. blood were for the deprived 3.39, and for the normal and pair-fed animals 1.51 and 1.46, respectively.—E. M. Hume.

1769

PECORA, L. J. and HIGHMAN, B. **Organ weights and histology of chronically thiamine-deficient rats and their pair-fed controls.** *J. Nutrition*, 1953, **51**, 219-229. [Nat. Inst. Arthritis Metabol. Dis., Nat. Inst. Health, Bethesda, Md.]

Weanling male albino rats received a commercial diet for 2 weeks and then were divided into 3 groups and received a diet deficient in vitamin B₁ with 7 µg. three times weekly, or the diet with adequate vitamin B₁ to appetite or with intake restricted to that of the partially deprived rats. After 63 days the first group was totally deprived of vitamin B₁, and from 7 to 10 days later the animals were killed and the organs were removed. Some normal rats were killed at about 33 days of age, when their weight was the same as that of the deprived rats, and some rats were killed in all groups when the deprived rats reached their maximum weight, at about 57 days of age.

The deprived rats grew normally for 4 weeks, then for 7 weeks lost weight amounting to 40 per cent. of their maximum weight. Before loss of weight began the ratios of organ weight to bodyweight were similar in the 3 groups, except for liver and spleen, for which the ratios were considerably smaller in the groups deprived of vitamin B₁ or food than in those with adequate diet. Subsequently, in the organ to bodyweight ratios for heart, adrenal glands, testes, pituitary gland, liver, spleen and brain there was no difference between rats deprived of vitamin B₁ and those with restricted food intake, which showed that the decreased size of the organs was due to inanition rather than to vitamin deficiency. The kidney to bodyweight ratio was considerably greater in the deprived rats than in those with restricted intake, indicating an additional effect of vitamin B₁ deficiency over that of inanition.

The absolute loss in weight of organs was similar in groups deprived of vitamin B₁ or food, except for the kidneys of the former group, which lost little. The weight loss of the organs was not proportional to the loss of bodyweight as it is in starvation. It is concluded that comparison could best be made between 100-day-old deprived rats and 57-day-old normal rats, in which the brain and adrenal weights were the same, and the weights of other organs, particularly the liver and spleen, were less in the deprived rats.

A small number of vitamin-deficient rats developed lesions of the auricular myocardium. The groups deprived of vitamin B₁ and those with restricted food intake showed depletion of lymphocytes in the spleen, diminished haemopoietic activity, haemosiderin deposits in the liver and spleen, and atrophy of some organs due to shrinkage of parenchymal cells.—V. R. Jackson.

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1770

ABBATI, A., CAVALLI, G., MARTINELLI, M. and POPPI, A. L'azione del citocromo c e della cocarbossilasi sulle modificazioni istologiche indotte nel ratto albino dalla carenza di tiamina. [The action of cytochrome c and of cocarboxylase on the histological changes induced in the white rat by vitamin B₁ deficiency.] *Arch. Sci. biol., Bologna*, 1953, **37**, 340-353. [Ist. Patol. Speciale Med., Univ. Bologna.]

Of 25 male rats weighing from 80 to 90 g., one group received a complete diet, one received water only, and one received a diet deficient in vitamin B₁. In the last group 5 rats were given 40 mg. cytochrome c, and 5 were given 200 mg. cocarboxylase, both per kg. bodyweight, injected intraperitoneally every 5 days. The experiment lasted 90 days. The rats having water alone lived only 15 days. In the deprived rats growth ceased and signs of deficiency appeared, but those given cytochrome c or cocarboxylase behaved like those having the complete diet. Histological and histochemical examination confirmed the results.

E. M. Hume.

1771

WILWERTH, A. M. and MEITES, J. **Effects of cortisone on thiamine-deficient young rats.** *Proc. Soc. Exp. Biol. Med.*, 1953, **83**, 872-875. [Dept. Physiol. Pharmacol., Michigan State Coll., East Lansing.]

Young male rats received a semi-synthetic diet containing no vitamin B₁ for 10 days and then for 12 or 18 days a dietary supplement of up to 20 mg. vitamin B₁ per kg. diet with or without 1 mg. cortisone acetate given subcutaneously. Growth and appetite were reduced in all the rats after 10 days' depletion, but both were restored in those given 1 mg. vitamin B₁ per kg. Those deprived for longer lost further weight, especially if given cortisone, although appetite was not further reduced. Addition of 1 mg. vitamin B₁ per kg. to the diet of deprived rats receiving cortisone partly overcame the lowering of growth rate, and eliminated gross signs of vitamin deficiency, including muscular inco-ordination and priapism. In a test with younger rats deprived for a longer period cannibalism appeared in the group receiving cortisone alone. If the vitamin supplement was 5, 10 or 20 mg., the inhibition of growth caused by cortisone was almost completely counteracted. Rats with restricted intake and 20 mg. vitamin B₁ per kg. diet and cortisone had a low bodyweight but no gross sign of deficiency. It is considered that the minimum protective dose of vitamin B₁ should be increased about 5 times to counteract the effect of injecting 1 mg. cortisone daily.

V. R. Jackson.

1772

SCHIFF, O. Einfluss von Luminal auf Vitamin B - Stoffwechsel und Diurese bei Ratten. [Effect of luminal on vitamin B₁ metabolism and diuresis in rats.] *Klin. Wochenschr.*, 1953, **31**, 707-708. [Med. Poliklin., Univ. Heidelberg.]

Rats maintained on a diet low in vitamin B₁ for 4 weeks and given a daily injection of 10 mg. luminal per 100 g. bodyweight showed no sign of vitamin B₁ deficiency. Diuresis was reduced in the first 3 hr. after the injection but was then greatly increased. No effect was observed of luminal on the urinary excretion of vitamin B₁.

E. M. Hume.

1773

LILLY, V. G., BARNETT, H. L. and ANDERSON, B. G. The effects of allithiamine on some thiamine-requiring organisms. *Science*, 1953, **118**, 548-549. [Dept. Plant Pathol., W. Virginia Univ., Morgantown.]

The activity was estimated of allithiamine for 5 fungi requiring vitamin B₁ for normal growth. The fungi were incubated at 20° C. in media containing glucose and asparagine, and insufficient amounts of vitamin B₁ and allithiamine. Growth was estimated by weighing the dried mycelium.

Allithiamine was more active than vitamin B₁ for *Endoconidiophora fimbriata*, *Mucor ramannianus* and *Phycomyces blakesleeanus*, and less active for *Schizothecium longicolle* and *Thielaviopsis basicola*. Aqueous extracts were prepared from mycelium of *P. blakesleeanus* grown with allithiamine or vitamin B₁, and by comparison of the effects on the growth of fungi of these extracts before and after treatment with alkaline ferricyanide and CNBr which destroy allithiamine completely but vitamin B₁ only partially, it was con-

cluded that *P. blakesleeanus* converted allithiamine to vitamin B₁.

Experiments with young rats made deficient in vitamin B₁ showed that allithiamine could replace vitamin B₁ and gave good growth.—V. R. Jackson.

1774

DOUDNEY, C. O. and WAGNER, R. P. A relationship of homocysteine metabolism to thiamin, serine and adenine biosynthesis in a mutant strain of *Neurospora*. *Proc. Nat. Acad. Sci., Washington*, 1953, **39**, 1043-1052. [Dept. Zool., Univ. Texas.]

1775

MAESEN, T. J. M. On the influence of thiamine and ammonium ions on alcoholic fermentation. *Biochim. biophys. Acta*, 1953, **12**, 445-461. [Lab. Physiol. Chem., Univ. Utrecht.] French and German summaries.

1776

NARAYANA RAO, M. and SWAMINATHAN, M. Nutritive value of undermilled and milled raw rice. *Bull. Central Food Technol. Res. Inst. Mysore*, 1953, **2**, 262-263. [Div. Biochem. Nutrit.]

A preliminary note is made on the results of chemical analyses and of rat feeding experiments made with rice milled to contain 1.8 µg. vitamin B₁ per g. as recommended by an FAO Nutrition Committee (*Nutrition Abstracts and Reviews*, **18**, 468). Detailed results await publication; those given show that growth on husked rice, on rice milled as recommended or on rice similarly milled after parboiling was significantly better than on raw rice of low extraction rate with only 1.1 µg. vitamin B₁ per g.—D. Harvey.

See also Abst. 2099.

RIBOFLAVIN

1777

HOOVER, A. A. and JAYASURIYA, G. C. N. Microbiological assay of vitamins. 2. Riboflavin. *Ceylon J. Med. Sci.*, 1951-53, **8**, 183-189. [Dept. Biochem., Med. Res. Inst., Colombo.]

Details of media and mode of extraction are given for estimating riboflavin in local vegetables and fruits with *Lactobacillus casei* as test organism. The values in µg. per 100 g. for some cereal products were for brown rice 140, kurakkan (*Eleusine coracana*) flour 110, maize flour 159 and sorghum flour 232. Contents of from 10 to 60 µg. per 100 g. were found in plantains, gourds and similar vegetables. Leafy vegetables contained from 46 to 720 µg. per 100 g.

A. M. Copping.

1778

KAUNITZ, H., WIESINGER, H. and SLANETZ, C. A. Probleme des Riboflavinstoffwechsels. [Problems of riboflavin metabolism.] *Wien. klin. Wochenschr.*, 1953, **65**, 709-713. [Dept. Pathol., Coll. Phys. Surg., Columbia Univ., New York.]

The problem of riboflavin metabolism is reviewed with particular reference to recent studies with rats having diets containing varying proportions of protein and fat. The rapid onset of corneal vascularisation with a diet containing 5 per cent. casein and 20 per cent. lard was not delayed by administration of riboflavin, but with higher proportions of casein the development of the lesions was delayed. The inference that riboflavin is

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intimately concerned in protein metabolism is discussed with other probable roles of the vitamin.

A. M. Copping.

1779

MILLER, C. O., ELLIS, N. R., STEVENSON, J. W. and DAVEY, R. **The riboflavin requirement of swine for reproduction.** *J. Nutrition*, 1953, **51**, 163-170. [Bur. Animal Indust., U.S. Dept. Agric., Beltsville, Md.]

Young sows received diets containing 0.55, 0.83, 1.25 or 1.65 mg. riboflavin per lb. Sufficient protein was included for gestation and lactation. The sows were mated at 9 months and all but the first group were re-mated after the first litter was weaned.

The smallest amount of riboflavin proved inadequate for reproduction; 3 of 7 sows died, 3 more failed to conceive and 1 produced a litter which died within 48 hr. Among the other groups no difference was apparent in the sows, but those receiving 0.83 mg. vitamin per lb. diet produced litters of low viability and weighing significantly less than those receiving 1.25 mg. There appeared to be little improvement in the performance of those receiving 1.65 mg. per lb. over those with 1.25 mg. Second litters were heavier than first litters in these 2 groups but less in those receiving 0.83 mg. per lb., showing that the effects of deficiency were cumulative. A minimum of 1.25 mg. riboflavin per lb. diet is recommended for breeding sows.—V. R. Jackson.

1780

RICHERT, D. A. and WESTERFELD, W. W. **Some interrelations of dietary protein, molybdenum, riboflavin and calories on liver and intestinal xanthine oxidase.** *Proc. Soc. Exp. Biol. Med.*, 1953, **83**, 726-729. [Dept. Biochem., Med. Coll. State Univ. New York, Syracuse.]

Weanling male albino rats were divided into 4 groups and given a diet containing 24 per cent. casein and 65 per cent. glucose with both riboflavin and Mo (control group), either riboflavin or Mo, or neither. Other requirements were met. A fifth group received the control diet but with intake restricted to 23 per cent. of that of the control group and a sixth group a diet containing 96 per cent. casein and 4 per cent. salt mixture, all vitamins and Mo, with intake restricted to 25 per cent. of that of the control group. The last group was then receiving the same amount of energy daily as the fifth group and the same protein daily as the control group. After from 2 to 3 weeks estimations were made of xanthine oxidase in the liver and intestine.

The omission of riboflavin or Mo or both from

the diet containing 24 per cent. casein had no effect on liver xanthine oxidase. Omission of Mo with or without riboflavin removed the enzyme from the intestine, and deprivation of riboflavin with Mo present reduced the concentration to half that of rats receiving riboflavin and Mo. The oxidase-dehydrogenase activity of the enzyme in the liver and intestine was not affected by either deficiency. Restricted intake of the diet containing 24 or 96 per cent. casein had no effect on liver or intestinal xanthine oxidase.

The intake of protein appeared to have the greater effect on the liver enzyme and of Mo on the intestinal enzyme.—V. R. Jackson.

1781

DIETRICH, L. S. and SHAPIRO, D. M. **Combination chemotherapy of cancer: potentiation of carcinostatic action of 8-azaguanine by a riboflavin analog.** *Cancer Res.*, 1953, **13**, 699-702. [Dept. Biochem., Coll. Phys. Surg., Columbia Univ., New York.]

Mammary adenocarcinomata were transplanted into the axillary region of female mice aged from 2 to 3 months. The effect was recorded of injecting, per kg. bodyweight, 50 mg. 8-azaguanine and 60 mg. flavotin simultaneously or in succession. Methods of estimation and analysis were described previously (Abst. 1597, Vol. 23).

The carcinostatic action of 8-azaguanine was enhanced when flavotin was given 1 hr. previously; if the substances were given simultaneously or the flavotin after the purine there was no effect. In tests *in vitro*, animals were killed 1 hr. after the last injection of flavotin, homogenates were made of tumours and livers, and guanase and xanthine oxidase activities were estimated. The addition of flavotin to the liver homogenates during incubation had no effect on the activity of guanase or xanthine oxidase activity. No xanthine oxidase was found in tumours from animals treated with flavotin but in tumours from untreated animals there were measurable amounts, one-eighth to one-tenth of that in the liver.

It was concluded and confirmed that flavotin inhibited xanthine oxidase. It was observed that guanase activity was inhibited by increasing amounts of xanthine in a phosphate or borate medium, and it is suggested that flavotin enhances the carcinostatic action of 8-azaguanine by inhibiting tumour xanthine oxidase and, therefore, indirectly inhibiting guanase, which is responsible for the deamination of 8-azaguanine to 8-azaxanthine, a non-carcinostatic compound.

V. R. Jackson.

See also Abst. 2183.

NICOTINIC ACID (NIACIN)

1782

SWEENEY, J. P. **Report on a chemical method for nicotinic acid.** *J. Assoc. Off. Agric. Chem.*, 1953, **36**, 856-857. [Food and Drug Admin., Dept. Health, Washington, D.C.]

After further collaborative trials of the sulphanilic acid method previously described (*ibid.*, 1951, **34**, 99; 380) it is recommended that the method be made official.—W. Godden.

1783

SWEENEY, J. P. and HALL, W. L. **The use of ion exchange resin in the quantitative chemical differentiation between nicotinic acid and nicotinamide.** *J. Assoc. Off. Agric. Chem.*, 1953, **36**, 1018-1022. [Food and Drug Admin., Dept. Health, Washington, D.C.]

The anion exchange resin Amberlite IRA-400, which had been found by Kato and Shimizu (*Abst.* 3421, Vol. 21) not to adsorb nicotinamide, was found to adsorb nicotinic acid, which could be eluted subsequently with *N* HCl. The nicotinamide and nicotinic acid could be estimated with CNBr and sulphanilic acid as reported previously (*Abst.* 3423, Vol. 21). One part of nicotinamide could be estimated accurately in the presence of 100 parts of nicotinic acid, and 1 part of the acid in the presence of 100 parts of the amide provided a correction was applied for slight hydrolysis of nicotinamide by the resin.

W. Godden.

1784

CHAUDHURI, D. K. **Estimation of nicotinic acid in urine.** *Ann. Biochem. Exp. Med.*, 1952, **12**, 119-122. [Dept. Appl. Chem., Nutrit. Res. Unit, Indian Council Med. Res., Calcutta.]

Nicotinic acid was estimated in normal or diabetic urine by digesting with concentrated HCl for 45 min. over a water bath, centrifuging and extracting the supernatant fluid with *isobutanol*. The water phase was heated with 4 per cent. KMnO_4 , cooled and brought to pH 6.6, and a mixture of ethanol and water was added to make up the required volume. After further cooling in a refrigerator, a yellow colour was developed with *p*-aminobenzoic acid in the colourless extract, and estimated in a photo-electric colorimeter. The method was found specific for nicotinic acid and amide with recoveries ranging from 98 to 104 per cent. Values for 6 estimations on a single sample ranged from 15.5 to 20.3, average 17.1 μg . in 20 ml.—V. R. Jackson.

1785

UKITA, T., MIZUNO, D. and KOSAKA, S. **On the vitamin-like activity of 3-carbamyl-pyridinium-halides.** *Jap. J. Med. Sci.*, 1953, **6**, 171-177.

[Nat. Inst. Health, Inst. Infect. Dis., Univ. Tokyo.]

See Title 425, Vol. 24.

1786

COTÉ, L., HUGHES, J., OLESON, J. J. and WILLIAMS, J. H. **Studies on nicotinamide antagonists.** *Exp. Med. Surg.*, 1953, **11**, 96-102. [Lederle Labs. Div., Amer. Cyanamid Co., Pearl River, N.Y.]

1787

QUAGLIARIELLO, E., FIDANZA, F., DELLA PIETRA, G. and SCALA, E. **Interrelazione triptofano-acido nicotinico nell'uovo di pollo nel corso dello sviluppo embrionale. [Interrelation of tryptophan and nicotinic acid in the hen's egg during embryonic development.]** *Arch. Sci. biol., Bologna*, 1953, **37**, 355-368. [Ist. Chim., Fac. Med., Univ. Naples.]

See *Abst.* 4259, Vol. 23.

1788

QUAGLIARIELLO, G. and PORCELLATI, G. **Sulla amidazione enzimatica dell'acido nicotinico. [Enzymic conversion of nicotinic acid to amide.]** *Boll. Soc. ital. Biol. sper.*, 1953, **29**, 273-275. [Ist. Chim. Biol., Univ. Naples.]

Kidney and liver tissue from rats of weight about 500 g. was incubated in modified Ringer solution containing 0.0012 *M* ammonium nicotinate, through which a mixture of 95 per cent. O_2 and 5 per cent. CO_2 was passed. For measuring the amount of nicotinamide formed, a chemical method is described which is considered to give much more accurate results than paper chromatography. Little nicotinamide was found with sodium compared with ammonium nicotinate.

E. M. Hume.

1789

HUGHES, D. E. and WILLIAMSON, D. H. **The deamidation of nicotinamide by bacteria.** *Biochem. J.*, 1953, **55**, 851-856. [Med. Res. Council. Unit Res. Cell Metabol., Univ. Sheffield.]

The deamidating enzyme was present in washed cells and cell-free extracts of lactobacilli, including *L. casei*, *L. delbrueckii*, *L. helveticus* and particularly *L. arabinosus* and *L. bulgaricus*. The reaction was shown to be a stoichiometric hydrolysis giving nicotinic acid and ammonia, the rate of reaction being proportional to the enzyme concentration. Nicotinamide was decomposed completely and the reaction was not inhibited by high concentrations of nicotinic acid or ammonia; it did not depend on the concentration of nicotinic acid or its derivatives or on the absence of glucose from the

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medium in which the cells were grown or on its pH or on the age of the cells. Nicotinamide was not formed when the enzyme preparations were incubated with ammonium nicotinate, with or without adenosine triphosphate, glutamine, Mg and Mn.

The optimum range of pH for the enzyme was from 4.5 to 8.0; below 4.5 activity decreased rapidly. The apparent Michaelis constant was 0.0015 M. The enzyme was specific for deamidating nicotinamide and could be used for estimating free nicotinamide in tissues, but the method was less convenient than chemical methods. Freshly washed cells lost up to 25 per cent. of their activity after 7 days at 2° C., but extracts were stable. Dialysis against water, phosphate buffer at pH 7 or acetate buffer at pH 5 caused no loss of activity. Heating or treatment with ethanol, ammonium sulphide or sulphate caused loss of activity. The enzyme was inhibited by ions of heavy metals but not by substances related to nicotinamide, phenol- or sulphonophthaleins, acridine, atebine or euflavine or several other compounds.

Other organisms tested included *Staphylococcus albus* and *aureus*, *Streptococcus haemolyticus*, *Clostridium welchii*, *Bacterium coli*, *Acetobacter suboxydans*, *capsulatus* and *aceti*, *Aerobacter aerogenes* and *Pseudomonas fluorescens*. Only one strain of *Staph. albus* deamidated nicotinamide significantly.

The use of the enzyme for identifying and estimating pyridine derivatives is discussed.

V. R. Jackson.

1790

BERA, G. N. **Effects of niacin and nicotinamide on blood sugar.** *Amer. J. Physiol.*, 1953, **175**, 296-298. [Dept. Physiol., Presidency Coll., Calcutta.]

Nicotinic acid or nicotinamide or adrenaline was injected into the muscle of adult rabbits. Blood sugar rose to a maximum within 1 hr. after injection of each of them. The effect of nicotinic acid and nicotinamide resembled that of adrenaline, and the adrenaline content of the blood was raised when nicotinic acid or amide was injected. The presence of adrenaline was further demonstrated by a rise of blood pressure after injection into a cat of blood from a rabbit which had received nicotinic acid.—A. M. Copping.

1791

DE FRANCISCIS, G. and MARSICO, F. **Il comportamento del ferro serico dopo iniezione endovenosa di vitamina PP in cani normali e splenectomizzati. [Behaviour of iron in the serum after intravenous injection of vitamin PP in normal and splenectomised dogs.]** *Boll. Soc. ital. Biol. sper.*, 1953, **29**, 267-269. [Ist. Fisiol. Vet., Univ. Naples.]

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Blood was taken from 5 dogs of bodyweight about 7 kg., fasting for 12 hr., before and 4, 30, 60, 120, 180 and 240 min. after intravenous injection of 3 mg. vitamin PP (Nicotene Lepetit), and serum proteins and Fe were estimated. Three of the animals were splenectomised, and the experiment was repeated from 15 to 45 days later. Before and after splenectomy, injection of the vitamin caused an immediate severe fall in serum Fe and a subsequent rise. In the intact dogs the normal value was restored within 60 min., but in the splenectomised dogs the rise was much less and normal values had not been attained after 240 min. Serum albumin fluctuated after the injection, and there was a marked fall in the albumin: globulin ratio. The behaviour of the serum proteins was not affected by splenectomy.

E. M. Hume.

1792

SUNDE, M. L. **The niacin requirement of chickens from 6 to 11 weeks.** *Poultry Sci.*, 1953, **32**, 926. *Proc.* [Univ. Wisconsin, Madison.]

1793

SLINGER, S. J., PEPPER, W. F., MORPHET, A. M. and EVANS, E. V. **Effect of penicillin on the niacin requirement of turkeys and a carry-over effect of penicillin from dams to progeny.** *Poultry Sci.*, 1953, **32**, 754-762. [Dept. Poultry Husb., Ontario Agric. Coll., Guelph.]

Bronze-breasted poults of both sexes were given for 4 weeks a practical rearing diet containing, per lb., 11.7 mg. nicotinic acid, supplemented with graded amounts of nicotinic acid with or without 10 p.p.m. of procaine penicillin. Growth was not increased by adding nicotinic acid in absence of penicillin; in its presence slightly better growth was obtained with from 16.7 to 21.7 mg. nicotinic acid per lb. feed than with the unsupplemented basal diet. In a second experiment, poults received for 24 weeks basal diets with or without 7.5 mg. added nicotinic acid and with or without penicillin. Penicillin improved growth and increased efficiency of feed utilisation whether the diet contained added nicotinic acid or not. The presence of penicillin in the diet of the dams adversely affected the growth of the poults. No perosis occurred in the females; in the males it was completely prevented up to 16 weeks of age, and partly at 24 weeks, by nicotinic acid and penicillin together, but not by either alone.

E. M. Cruickshank.

1794

KATO, M. **The metabolism of niacin in insects.** *Science*, 1953, **118**, 654. [Hyogo Exp. Stat. Sericulture, Hidaka-cho, Kinosaki-gun, Japan.]

No N¹-methylnicotinamide was found in urine from the herbivorous insect *Bombyx mori*, or the

carnivorous insect *Lucilia caesar*. N¹-methyl-nicotinamide added to the urine was detected by the method used. It is concluded that the

metabolism of nicotinamide in insects is different from that in carnivorous mammals.

V. R. Jackson.

VITAMIN B₆ (PYRIDOXINE, ADERMIN)

1795

SNYDER, J. Q. and WENDER, S. H. **The separation and determination of pyridoxine, pyridoxal and pyridoxamine by paper chromatography and microbiological assay.** *Arch. Biochem. Biophys.*, 1953, **46**, 465-469. [Dept. Chem., Univ. Oklahoma, Norman.]

Stock solutions of the hydrochlorides of pyridoxine, pyridoxal and pyridoxamine were spotted on to strips of paper and developed; one-dimensional development in the dark in sealed containers at constant temperature was employed, with a mixture of *n*-amyl alcohol, acetone and water and the ascending technique. When the paper was sprayed with a solution of 2:6-dichloroquinone-chloroimide in benzene, and then saturated with vapour from hot ammonium chloride solution, blue spots characteristically placed for the 3 substances under test were obtained. For the quantitative work a sprayed paper could be used to show the regions covered by the 3 test substances on unsprayed papers. The papers could then be cut up and water solutions made of the 3 test substances in the paper sections. Estimation was by a method with *Saccharomyces carlsbergensis* A.T.C.C. 9080.—R. Marshall.

1796

MUSINI, A. and TENCONI, L. T. **Studio parallelo di lesioni anatomo-cliniche (oculari) e biochimiche (metabolismo del triptofano) in ratti carenti di axeroftolo o di piridossina. [Parallel study of lesions, structural (eye) and biochemical (metabolism of tryptophan), in rats deprived of vitamin A or pyridoxine.]** *Acta vitaminol.*, 1953, **7**, 200-212. [Div. Oculistica, Osp. Maggiore, Milan.] English, French, German and Spanish summaries.

One series of rats aged 47 days and weighing from 90 to 105 g. received a diet deficient in vitamin A, and another received one deficient in vitamin B₆. In each series, one group of 9 rats received the missing vitamin from the start, one received it from the fifth week of deprivation, and one did not receive it at all. The eyes of all the animals were examined regularly with the slit-lamp. After death the eyes were fixed in formalin for histological examination. Urine was collected for 24 hr. after tests with a single dose of L-tryptophan, 500 mg. per kg. bodyweight, and xanthurenic acid and kynurenine were estimated by paper chromatography. In the rats deprived of vitamin B₆, the amounts of xanthurenic acid and kynurenine

excreted were much increased and fell again when pyridoxine was given, but in the rats deprived of vitamin A there was no change. The macroscopic and histological appearance of the eye lesions is described, and it is pointed out how closely the effects on the eye of the two deficiencies resemble one another.—E. M. Hume.

1797

KOTAKE, Y. (Jr.) and INADA, T. **Studies on xanthurenic acid. 1. The effect of fatty acid on the excretion of xanthurenic acid, and its relation to pyridoxine. 2. Preliminary report on xanthurenic acid diabetes.** *J. Biochem., Tokyo*, 1953, **40**, 287-289; 291-294. [Biochem. Dept., Med. Coll., Wakayama.]

See Abst. 1973, Vol. 22.

1798

BEATON, J. R., BEARE, J. L., BEATON, G. H. and MCHENRY, E. W. **Studies on vitamin B₆. 4. The effect of vitamin B₆ on protein synthesis and maintenance in the rat.** *J. Biol. Chem.*, 1953, **204**, 715-719. [Dept. Pub. Health Nutrit., Sch. Hyg., Univ. Toronto.]

Groups of rats were given a purified diet containing 20 per cent. casein and 20 per cent. fat. Some received no pyridoxine and others had 50 µg. daily. The food intake of all the animals was restricted to the amount eaten by those having no vitamin B₆. In a study of the synthesis of liver protein by measuring tissue regeneration after partial hepatectomy all animals received deoxypyridoxine. In rats deprived of vitamin B₆ there was no apparent change in the amount of total crude fatty acid, protein or moisture in the liver whether part of the liver was excised or not. In rats which had had part of the liver excised neither the amount nor the constituents of the regenerated tissues differed in groups with and without vitamin B₆. The glutamic acid dehydrogenase activity of the livers was similar in all groups. The findings are considered as evidence that lack of vitamin B₆ does not in the rat affect the synthesis of cellular protein or the maintenance of liver-enzyme protein.—A. M. Copping.

1799

BRAUNSHTEIN, A. E. **[Function of vitamin B₆ in amino-acid metabolism.]** *Uspekhi Sovrem. Biol.*, 1953, **35**, No. 1, 27.

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1800

BLASCHKO, H., DATTA, S. P. and HARRIS, H. **Pyridoxin deficiency in the rat: liver L-cysteic acid decarboxylase activity and urinary amino-acids.** *Brit. J. Nutrition*, 1953, **7**, 364-371. [Dept. Pharmacol., Univ. Oxford.]

Weanling rats received a diet similar to that described by Carpenter *et al.* (Title 427, Vol. 19) containing succinylsulphathiazole and with or without pyridoxine. Two groups received the vitamin, one of the same age as the deprived rats but considerably heavier, and one of the same weight but younger. The deprived animals ceased to gain weight in the third week, their coats were poor and skin lesions appeared. Urine was collected after from 9 to 47 days for chromatographic examination. Rats were killed immediately after urine collection and L-cysteic acid decarboxylase activity (Title 4913, Vol. 19) was estimated in the liver.

The urine of rats receiving pyridoxine contained taurine, and also glycine, alanine and other amino-acids in variable small amounts. The urine of deprived rats contained glycine and a substance provisionally identified as ethanolamine phosphate; taurine was found in some samples but the incidence decreased with length of deprivation. L-Cysteic acid decarboxylase activity was present in the livers of rats given pyridoxine but not of deprived rats. When livers of non-deprived male rats, which had greater enzyme activity than those of female rats, were incubated with and without L-cysteic acid, the enzymic decarboxylation of L-cysteic acid was shown to produce taurine and CO₂. The appearance of other amino-acids during incubation was probably due to autolysis of liver tissue.

Two rats were deprived of riboflavin; urine from both contained taurine but no ethanolamine phosphate and both livers possessed L-cysteic acid decarboxylase activity.—V. R. Jackson.

1801

BUTLER, L. C. and MORGAN, A. F. **Eosinopenic responses of pyridoxine-deficient rats to epinephrine, adrenocorticotrophic hormone and hypoxia.** *Proc. Soc. Exp. Biol. Med.*, 1953, **83**, 655-659. [Dept. Home Econ., Univ. California, Berkeley.]

The eosinopenic response, induced by saline, adrenaline, adrenocorticotrophic hormone, fasting, or low oxygen tension, was measured in adult male rats given a diet with or without pyridoxine. Vitamin B₆ deficiency was enhanced by inclusion of deoxypyridoxine in the diet of the deprived rats, and one group given pyridoxine was restricted in food intake so that their weight loss was that of the deprived group. The non-deprived rats whose food was unrestricted gained on an average 1 per

cent. in weight during the 8 weeks of the test; the other two groups lost 29 per cent. The eosinopenic response at 4, 7 and 8 weeks to all the treatments in intact rats and in a group of hypophysectomised rats treated with adrenocorticotrophic hormone was of the same order whether pyridoxine was given or not, and whether the animals lost weight or gained slightly.—A. M. Copping.

1802

MORRIS, H. P., DUNN, T. B. and WAGNER, B. P. **Influence of gonadotrophin on pyridoxine-deficient and diet-restricted female mice.** *J. Nat. Cancer Inst.*, 1953, **14**, 493-511. [Nat. Cancer Inst., Bethesda, Md.]

Weanling female mice were given a synthetic diet with or without pyridoxine, and the food of some having supplements was restricted to that of those without. Some animals for from 3 to 10 weeks received injections of gonadotropin from the second or seventh week. The hormone had little effect on food intake or weight gain, but increased the size of the ovaries; the increase was greater in the deprived mice than in those having pyridoxine. In both deprived and non-deprived the mammary glands showed proliferation of the duct epithelium in harmony with the ovarian changes. In the deprived mice little degeneration of the X-zone of the adrenal glands occurred, and the degeneration was only partial in non-deprived mice with restricted food intake. When gonadotropin was given to these animals the X-zone disappeared but no lipid was formed.

Gonadotropin had no apparent effect on the blood picture, which was characterised by low Hb values and low erythrocyte and lymphocyte counts.—A. M. Copping.

1803

BEATON, G. H. and MCHENRY, E. W. **Vitamin B₆ levels in rat tissues.** *Brit. J. Nutrition*, 1953, **7**, 357-363. [Dept. Pub. Health Nutrit., Univ. Toronto.]

Rats of the Wistar strain were given a diet lacking vitamin B₆ and containing 20 per cent. casein and 20 per cent. maize oil, with or without addition of deoxypyridoxine. In an experiment in which the food intake of all groups was restricted to that of the most severely deprived rats, the concentration of vitamin B₆ in the livers of rats given deoxypyridoxine with or without added pyridoxine was not less than in rats of corresponding groups with no antivitamin. In a further test, groups of rats were killed at intervals, and it was found that when a low concentration of vitamin B₆ was established in the tissues, administration of deoxypyridoxine reduced the time till appearance of the characteristic lesions of vitamin B₆ deficiency. The presence of deoxypyridoxine in the

diet did not prevent recovery from acute deprivation when pyridoxine was given. The vitamin B₆ content of the heart, liver and kidney and of the whole carcass was estimated with *Saccharomyces carlsbergensis*. From the relation between the vitamin B₆ content of the whole carcass and that of the liver, it appeared that in deficiency transfer might occur from extrahepatic sources into the liver. The vitamin B₆ content of the liver was found more useful than that of the heart or kidney for indicating the state of vitamin B₆ nutrition. At the same time, it was observed that the liver became saturated with vitamin B₆ when the amount in the diet was not enough to support maximum growth.—A. M. Copping.

1804

BEARE, J. L., BEATON, J. R., SMITH, F. I., WHITE, J. M. and MCHENRY, E. W. **Effects of adrenalectomy and of adrenal cortical extract in pyridoxine-deprived and supplemented rats.** *Amer. J. Physiol.*, 1953, **175**, 21–24. [Dept. Pub. Health Nutrit., Univ. Toronto.]

The effect of giving adrenal cortical extract to adrenalectomised rats having a synthetic diet lacking vitamin B₆ and containing 20 per cent. casein was examined by studies of blood and tissue composition and of N output in faeces and urine. Removal of the adrenal glands prevented the occurrence of severe skin lesions in rats deprived of vitamin B₆ and given deoxypyridoxine, but did not alter the characteristic metabolic disturbances (*cf.* Abst. 2930, Vol. 23). The results of administering adrenal cortical extract with and without pyridoxine showed that no significant change in the metabolic pattern of vitamin B₆ deficiency was induced by the cortical hormones. The hormones were apparently not concerned in the utilisation of pyridoxine by the rat.—A. M. Copping.

PANTOTHENIC ACID

1806

SCHWEIGERT, B. S. and GUTHNECK, B. T. **Liberation and measurement of pantothenic acid in animal tissues.** *J. Nutrition*, 1953, **51**, 283–293. [Div. Biochem. Nutrit., American Meat Inst. Found., Chicago, Ill.]

Enzyme preparations suitable for liberating pantothenic acid from co-enzyme A and from animal tissues were investigated. Of 6 different preparations from pigeon liver, pig kidney, lamb kidney and intestinal phosphatase, a mixture of intestinal phosphatase and a Dowex-treated pig-kidney extract was finally adopted as giving the best extraction of pantothenic acid. The results obtained were generally higher than those previously obtained by digestion with Mylase P.

1805

SHAPIRO, D. M., SHILS, M. E. and DIETRICH, L. S. (with ATTI, A., BORRIES, E., FINE, A., FUGMANN, R., HAYWORTH, P. and ZANAR, E.) **Quantitative biochemical differences between tumor and host as a basis for cancer chemotherapy. 1. Vitamin B₆.** *Cancer Res.*, 1953, **13**, 703–708. [Dept. Surg., Coll. Phys. Surg., Columbia Univ., New York.]

Mice aged from 2 to 4 months, receiving an adequate diet to appetite, were implanted in the axillary region with mammary adenocarcinoma. Daily injections of testosterone, deoxypyridoxine or both were started at intervals after implantation. Some animals received 8-azaguanine as well. The test lasted about 21 days. Estimations were made of vitamin B₆ microbiologically, and of glutamic-aspartic acid transaminase activity colorimetrically, in the tumours and in the tissues of several organs.

Vitamin B₆ concentration was much less in tumour tissue than in any normal tissues, except spleen, lung and sometimes testis. Treatment with testosterone significantly reduced the content of the tumours, but had no effect on their growth. The tumours had been previously shown to be sensitive to deoxypyridoxine (Absts. 459, Vol. 19; 1753, Vol. 20). Combination of deoxypyridoxine with, testosterone inhibited tumor growth at a dosage of deoxypyridoxine which, alone, was ineffective. The triple combination of 8-azaguanine, deoxypyridoxine and testosterone was more effective in inhibiting tumour growth than 8-azaguanine alone or any double combination. Transaminase activity was low in tumour tissue and was inhibited by deoxypyridoxine; inhibition of the enzyme in normal and tumour tissue was inversely proportional to the enzyme concentration.—V. R. Jackson.

1807

MARNAY, C. **Libération de l'acide pantothenique de diverses formes combinées distinguées par chromatographie sur papier et hydrolyses**

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enzymatiques. [**Liberation of pantothenic acid in different combined forms differentiated by paper chromatography and by enzymic hydrolysis.**] *Bull. Soc. Chim. biol.*, 1953, **35**, 1171-1176. [Lab. Hyg., Fac. Pharm., Paris.]

Extracts were made of rat liver, heart and kidney by boiling, autolysis or enzyme action; paper chromatograms were made and compared with those for pure pantothenic acid, pantethine and co-enzyme A.

The presence of free pantothenic acid was demonstrated in the liver and kidneys. Autolysis of liver, heart and kidney tissue produced free pantothenic acid with the same chromatogram as the pure vitamin and the same effect on the growth of *Lactobacillus arabinosus*. For the last test the organisms were incubated with the appropriate zones cut from the chromatogram papers and growth was estimated electrophotometrically.

Co-enzyme A was released from tissues by hydrolysis with Lipmann's enzymes (Abst. 1840, Vol. 17) and was found to be present in large amounts in liver and kidney, but it was not affected by Mylase P which did, however, act upon another conjugate of the vitamin in these tissues. Another form, which was very mobile on the chromatogram, was not identified.

A conjugated form of pantothenic acid was found in heart tissue which was hydrolysed only slightly by Lipmann's enzymes and more by Mylase P than were the conjugated forms in liver and kidney. This finding tended to confirm the observation made by King *et al.* (Abst. 469, Vol. 19) of a form in heart tissue conjugated differently from co-enzyme A and resistant to alkali.

V. R. Jackson.

1808

NOVELLI, G. D. **Metabolic functions of pantothenic acid.** *Physiol. Rev.*, 1953, **33**, 525-543. [Biochem. Res. Lab., Massachusetts Gen. Hosp., Boston.]

1809

MOUCHETTE, R. Action de l'acide pantothenique sur la régénération de la peau de cobaye. [**Effect of pantothenic acid on skin regeneration in the guineapig.**] *C.R. Soc. Biol.*, 1953, **147**, 1306-1309. [Inst. Histol., Univ. Liège.]

Skin lesions were made on the hind paws of young male guineapigs by an application of carbon dioxide snow. Immediately afterwards and subsequently, daily, one paw of each animal was painted with 5 per cent. Na pantothenate solution and the other was left untreated. In a few animals neither paw was treated, and in others intraperitoneal injections of pantothenate replaced the skin painting. Normal animals were treated with pantothenate. Samples of skin

were taken and mitoses were counted. Painting with pantothenate caused a considerable increase in the number of mitoses in damaged skin; some increase was observed also in the untreated paws and entire skin of the same animals, and also in the skin of the normal animals treated with pantothenate. Injection of pantothenate caused increased mitoses in areas of skin regeneration.

V. R. Jackson.

1810

GIUNCHI, G., FIDANZA, A., SCURO, L. A. and SORICE, F. Influenza della penicillina, diidro-streptomycina, cloramfenicolo ed aureomicina sull'accrescimento e sulla comparsa di anticorpi circolanti antieritrocitari in ratti alimentati con dieta priva di acido pantotenico. [**Effect of penicillin, dihydrostreptomycin, chloramphenicol and aureomycin on the growth and production of circulating haemolytic antibodies in rats given a diet without pantothenic acid.**] *Internat. Ztschr. Vitaminforsch.*, 1953, **25**, 1-7. [Ist. Clin. Med., Univ. Rome.] French, German and English summaries.

For the part of the paper concerning growth, see Abst. 451, Vol. 24.

The rats employed for the observations on growth were at the same time immunised by intraperitoneal injection of human red cells. The production of antibodies against human red cells was almost nil in the rats deprived of pantothenic acid; in the rats given antibiotics it was quite as good as in those given pantothenate, except for chloramphenicol, with which antibody production was somewhat less.—E. M. Hume.

1811

GIUNCHI, G., SCURO, L. A., SORICE, F. and FIDANZA, A. Acido pantotenico e produzione di anticorpi. [**Pantothenic acid and antibody production.**] *Riv. Ist. sieroterap. ital.*, 1953, **28**, 281-292. [Ist. Clin. Med., Univ. Rome.] English summary.

Of 59 rats weighing from 30 to 50 g., 25 were given a complete synthetic diet containing 100 mg. Ca pantothenate per kg. diet, and the remainder were given the diet without pantothenate. All the rats were immunised with human red cells, and 36 of them were immunised with a vaccine of *Salmonella typhi* or *Brucella melitensis*. From 10 to 25 days later the agglutinating titre of the blood was estimated. The result for red cell agglutinins was the same as is described in the preceding Abst. With the bacterial antigens, all the rats receiving pantothenate except 2 developed an agglutinating titre which was of varying strength; all except 3 of those deprived of pantothenic acid failed to do so.—E. M. Hume.

See also Abst. 2086.

BIOTIN

1812

LITSKY, W., KATSH, S., TEPPER, B. S. and ALPERN, J. **Studies on the biotin requirement of the rat.** *Growth*, 1953, **17**, 81-86. [Dept. Bacteriol., Univ. Massachusetts, Amherst.]

Groups of weanling rats receiving a diet very low in biotin grew moderately and did not develop signs of biotin deficiency, whereas animals on a diet containing a considerable amount of biotin and 40 per cent. of dried egg white grew very little and developed severe signs of biotin deficiency within about 40 days. Addition of sulphaguandine to the low-biotin diet did not produce the signs of deficiency. It seemed that with a purified diet an intake of 7 μ g. biotin per 10 g. food was adequate for maintenance of young rats.

A. M. Copping.

1813

LARDY, H. A. and PEANASKY, R. **Metabolic functions of biotin.** *Physiol. Rev.*, 1953, **33**, 560-565. [Dept. Biochem., Univ. Wisconsin, Madison.]

1814

HAM, W. E. and SCOTT, K. W. **Intestinal synthesis of biotin in the rat. Effect of deficiencies of certain B vitamins and of sulfasuxadine and terramycin.** *J. Nutrition*, 1953, **51**, 423-433. [Dept. Animal Husb., State Coll. Washington, Pullman.]

Weanling female rats received for 25 days a basal synthetic diet containing vitamins B₁, B₆, A and D, riboflavin, nicotinic acid, Ca pantothenate, choline and menadione. During the following 12 to 14 days urine and faeces were collected and microbiological estimations were made of biotin. The basal diet was varied by altering the proportions of sucrose and starch, by additions of sulphasuxidine or terramycin or both, and of folic acid, and by omission of single vitamins. In one series of tests the rats received a stock diet with or without addition of antibiotics and folic acid.

In rats receiving the basal diet, synthesis of

biotin was demonstrated in the intestine. On the addition of 2 per cent. sulphasuxidine, total synthesis and daily excretion were reduced by 50 per cent., and the addition of folic acid did not affect the reduction. Deficiency of vitamin B₁ decreased the total amount of biotin excreted but not the amount per g. faeces and, since faecal material was reduced by 40 per cent. compared with a non-deprived group, it appeared that the decreased excretion was due to anorexia caused by the deficiency. Deficiency of riboflavin, nicotinic acid or Ca pantothenate caused a decrease in total excretion and in the amount per g. excreta, showing that lack of them had a direct effect on synthesis by the intestinal flora. Deficiency of vitamin B₆ had no effect. Replacement of sucrose by raw potato starch increased the amount of biotin synthesised, even in the presence of sulphasuxidine. Terramycin had an effect like that of sulphasuxidine, and both together almost completely inhibited intestinal synthesis of biotin.

V. R. Jackson.

1815

TERROINE, T. **Protection par l'acide ascorbique contre la carence en biotine chez le rat. [Protection by ascorbic acid against biotin deficiency in the rat.]** *C.R. Acad. Sci.*, 1953, **237**, 1030-1032.

Three groups of rats received the biotin-deficient diet described previously (Abst. 452, Vol. 24), alone or with addition of vitamins B₁ and B₆ and riboflavin, or of 1 or 5 g. ascorbic acid per kg. diet.

The group without any supplement and that with additional B vitamins developed signs typical of biotin deficiency, including alopecia, spectacled eyes and abnormal gait. In the groups having ascorbic acid, the signs of deficiency were reduced or suppressed, survival time was decreased and growth rate was improved.

The results tended to confirm previous observations by De Felice (Abst. 436, Vol. 23) of a favourable effect of biotin on the general health of guineapigs and on tissue ascorbic acid values.

V. R. Jackson.

p-AMINO BENZOIC ACID

1816

NURMIKKO, V. **Studies on the biosynthesis of p-aminobenzoic acid by symbiosis experiments.** *Acta chem. scand.*, 1953, **7**, 942-950. [Biochem. Inst., Helsinki.]

A strain of *Lactobacillus arabinosus* needing phenylalanine for growth and of *Streptococcus faecalis* R needing folic acid were incubated separately or together in the medium of Henderson and Snell (Abst. 1656, Vol. 18) slightly modified,

as previously described (Nurmikko, *Acta chem. scand.*, 1952, **6**, 1258). Growth was estimated by electrometric titration.

Neither organism alone grew in the medium when folic acid, phenylalanine, adenine, guanine, xanthine, uracil and p-aminobenzoic acid were all omitted, but they grew together if all were omitted except p-aminobenzoic acid. p-Aminobenzoic acid could be replaced by L-phenylalanine for growth of *L. arabinosus* and, since *S. faecalis* did not need

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p-aminobenzoic acid, it was concluded that inhibition of symbiotic growth in a medium from which folic acid and phenylalanine had been omitted (see previous paper quoted above) was due to inability of *L. arabinosus* to synthesise *p*-aminobenzoic acid and folic acid in the absence of phenylalanine. The replacement of *p*-aminobenzoic acid by phenylalanine was inhibited by sulphanilamide and to some extent by benzoic acid. The inhibitory effect disappeared on addition of minute amounts of *p*-aminobenzoic acid.

In other symbiosis tests, *p*-aminobenzoic acid could be replaced by *p*-nitrophenylacetic, *p*-amino-phenylacetic, *p*-nitrobenzoic, *p*-iodobenzoic or *p*-aminohippuric acid. With the first two of these, *L. arabinosus* grew relatively more rapidly than *S. faecalis* R.

In the complete basal medium, shikimic acid could replace phenylalanine for *L. arabinosus*.

The mechanism of the conversion of phenylalanine to *p*-aminobenzoic acid is discussed.

V. R. Jackson.

FOLIC ACID (PTEROYLGLUTAMIC ACID)

1817

HEINRICH, M. R., DEWEY, V. C. and KIDDER, G. W. **Ion-exchange chromatography of pteroylglutamic acid and aminopterin.** *J. Amer. Chem. Soc.*, 1953, **75**, 5425-5426. [Biol. Lab., Amherst Coll., Mass.]

An ion exchange chromatogram of aminopterin showed a small peak in addition to that of aminopterin itself. The peak was characteristic of pteroylglutamic acid, of which it was possible to demonstrate the characteristic properties by collecting the impurity from a number of samples.

R. Marshall.

1818

ZAKRZEWSKI, S. F. and NICHOL, C. A. **The separation and determination of pteroylglutamic acid and related compounds.** *J. Biol. Chem.*, 1953, **205**, 361-368. [Dept. Pharmacol., Sch. Med., W. Reserve Univ., Cleveland, Ohio.]

Some antagonists of pteroylglutamic acid have been found to promote growth of *Tetrahymena* and *Streptococcus faecalis*, so a sample of aminopterin was examined by bio-autographic and chromatographic technique. With an aqueous solvent phase buffered to about pH 6.3, pteroylglutamic acid was isolated from aminopterin in considerable amount. Fluorimetric and microbiological estimations showed that from 22 to 24 per cent. was actually present. Such an amount of the growth-promoting substance would obviously complicate the study of resistance to the antagonist.

A. M. Copping.

1819

WOODRUFF, C. W., CLARK, S. L. (Jr.) and BRIDGEFORTH, E. B. **Folic acid deficiency in the guinea pig.** *J. Nutrition*, 1953, **51**, 23-34. [Dept. Paediat., Dept. Med., Vanderbilt Sch. Med., Nashville, Tenn.]

Guineapigs were given purified diets with vitamin and mineral supplements, or a commercial guineapig diet, from about 6 weeks of age for a period of 6 weeks. Blood studies were made with capillary blood from the ear or with heart blood. Growth was slower on the purified diets

than on the commercial mixture, and scurvy occurred if no vitamin C was given. In animals having no folic acid the growth rate was depressed but blood changes did not occur unless 1 per cent. sulphasuxidine was included; leucopenia, anaemia and immaturity of red cell precursors in the bone marrow then occurred, but were prevented by inclusion of 3.0 mg. folic acid per kg. diet. If *p*-aminobenzoic acid was omitted no blood changes occurred if folic acid was included. If both were omitted growth failed and blood changes were as severe as when sulphasuxidine was included in a diet without folic acid. Blood changes occurred with diets containing *p*-aminobenzoic acid and sulphasuxidine. The probable role of the intestinal flora in the synthesis of folic acid in the guineapig is discussed.—A. M. Copping.

1820

MALDONADO, J. F. and ASENJO, C. F. **The role of pteroylglutamic acid and vitamin B₁₂ on the development of *Nippostrongylus muris* in the rat.** *Exp. Parasitol.*, 1953, **2**, 374-379. [Sch. Med., Univ. Puerto Rico, San Juan.]

Weanling white rats were given a purified basal diet with or without a supplement of folic acid or vitamin B₁₂ or both, and another group had a normal commercial diet. After 3 weeks the rats were inoculated subcutaneously with infective larvae of *Nippostrongylus muris*. Nine days later they were killed, the adult worms were recovered from the intestine, and the larvae remaining in the lungs were counted. The numbers recovered from all the groups were about the same, and under the conditions of the study there was no evidence that folic acid or vitamin B₁₂ affected the development of the parasite.—A. M. Copping.

1821

RASK-NIELSEN, R. and BENNETT, E. **Investigations into the effect of thymonucleic acid fed to folic acid deficient chicks bearing Rous sarcomas.** *Acta pathol. microbiol. scand.*, 1953, **32**, 367-374. [Fibiger Lab., Inst. Pathol. Anat., Univ. Copenhagen.]

Chicks fed from hatching on a diet containing no folic acid, alone or with a supplement of folic acid or of thymonucleic acid and adenine, were inoculated with Rous sarcoma virus at the age of 6 days. Survival time, bodyweight and size of tumours were recorded.

In a first experiment the supplement of thymonucleic acid and adenine appeared to favour growth, but the result was not confirmed in a second test with a larger number of chicks. The number and size of the tumours in chicks having thymonucleic acid and adenine was less than in those having folic acid. In the second test there was no significant difference in susceptibility to tumours between the unsupplemented chicks and those having thymonucleic acid and adenine. It therefore remained doubtful whether thymonucleic acid and adenine could compensate for folic acid deficiency in the diet of chicks or not. A preliminary note with microbiological tests showed that chick pancreas could depolymerise thymonucleic acid, and that adenine was absorbed and incorporated into nucleic acids.—A. M. Copping.

1822

JACOBSON, W. **A folic acid derivative functioning during cell division.** *J. Physiol.*, 1953, **122**, 40P-41P. [Strangeways Res. Lab., Cambridge.]

1823

NIMMO-SMITH, R. H. and BROWN, D. J. **Some effects of 2-deaminopteroylglutamic acid upon bacterial growth.** *J. Gen. Microbiol.*, 1953, **9**, 536-544. [Microbiol. Unit, Dept. Biochem., Oxford.]

The capacity of 4 analogues of pteric acid and of 2-deaminopteroylglutamic acid to inhibit growth of *Streptococcus faecalis* R in presence of pteric acid or to stimulate its growth in absence of pteric acid was tested in a medium with or without pteric acid as source of folic acid. In some tests

ptericoic acid was replaced by pteroylglutamic acid, leucovorin or rhizopterin. Growth was estimated colorimetrically.

None of the compounds tested stimulated growth alone or in the presence of suboptimum amounts of ptericoic acid. With 2-deaminopteroylglutamic acid only, moderate inhibition of growth occurred in presence of ptericoic acid; the relation between ptericoic acid and its analogue was not exactly competitive, since the effect of the inhibitor increased greatly as the concentrations of both were increased. Growth supported by rhizopterin or leucovorin was less readily affected and inhibition decreased with increasing concentrations. With pteroylglutamic acid as source of folic acid the relation with the inhibitor appeared to be competitive. In a medium in which thymine and purine replaced folic acid, 2-deaminopteroylglutamic acid had no effect on growth.

In similar tests with *Lactobacillus casei*, growth was not supported by ptericoic acid or rhizopterin. Growth supported by pteroylglutamic acid was inhibited by 2-deaminopteroylglutamic acid, there being some evidence that the relation was competitive. Growth supported by leucovorin was more resistant to inhibition. Growth supported by thymine and purine was stimulated to a maximum by pteroylglutamic or 2-deaminopteroylglutamic acid. Explanations of the effect are discussed.

There was no effect of 2-deaminopteroylglutamic acid on the growth of organisms which did not need folic acid, including *Bacterium coli*, *L. arabinosus*, *L. plantarum* and *Schizosaccharomyces octosporus*.—V. R. Jackson.

1824

BEARSE, G. E., SAXENA, H. C., McCLARY, C. F., BLAYLOCK, L. G. and BERG, L. R. **Deficiency of folic acid in rations containing natural feed-stuffs.** *Poultry Sci.*, 1953, **32**, 889. *Proc. [W. Washington Exp. Stat., State Coll. Washington, Puyallup.]*

VITAMIN B₁₂

1825

FORD, J. E. **The microbiological assay of 'vitamin B₁₂'. The specificity of the requirement of *Ochromonas malhamensis* for cyanocobalamin.** *Brit. J. Nutrition*, 1953, **7**, 299-306. [Nat. Inst. Res. Dairying, Univ. Reading.]

The specific requirement of the protozoön *Ochromonas malhamensis* for vitamin B₁₂ was investigated with a modified synthetic medium similar to that developed by Hutner, Provasoli and Filfus (*Ann. N.Y. Acad. Sci.*, 1953, **55**, 852). Tests were made with cyanocobalamin, factors A, B and C (see Abst. 1839, Vol. 24), and pseudovitamin

B₁₂ for the growth of *Bacterium coli*, *Lactobacillus leichmannii*, *Euglena gracilis* and *Ochromonas malhamensis*. Compounds related to cyanocobalamin appeared incapable of replacing the vitamin for *Ochromonas*, which responded in a more specific manner than the other micro-organisms. Comparison with *Bact. coli* showed that *Ochromonas* gave the more satisfactory estimate of the true vitamin B₁₂ content of crude extracts from natural products, including those containing related substances which showed activity for *Bact. coli*. *Ochromonas* is therefore recommended as a test organism for vitamin B₁₂.—A. M. Copping.

N.A. and R., April 1954

1826

POLONOVSKI, M. and LÉVY, G. Microdosage microbiologique du facteur citrovorum. [**Microbiological micro-estimation of citrovorum factor.**] *Bull. Soc. Chim. biol.*, 1953, **35**, 1167-1169. [Serv. Biochim. Méd., Fac. Méd., Paris.]

Small tubes of capacity of 6 ml., containing 1 ml. of a synthetic medium which is described and 1 ml. of the solution to be examined, were sterilised and inoculated with *Leuconostoc citrovorum*. Nephelometric estimation was made of citrovorum factor after incubation for 20 hr. at 37° C. by comparison with standard curves obtained with solutions containing from 0.05 to 1.0 mμg. synthetic citrovorum factor per ml. The values were comparable with those obtained when 10 ml. medium were used. Titrimetric estimations could be made after incubation for 72 hr.

The observations of Gaines *et al.* (Abst. 3485, Vol. 21) that cortisone or its acetate possessed folic or folinic acid activity could not be confirmed. V. R. Jackson.

1827

McLAUGHLAN, J. M., CLARK, J. A. and CAMPBELL, J. A. The effect of cyanide on the apparent vitamin B₁₂ content of liver extracts in *E. coli* plate assays. *Arch. Biochem. Biophys.*, 1953, **46**, 244-246. [Food and Drug Lab., Dept. Nat. Health, Ottawa.]

When the vitamin B₁₂ potency of 6 different liver extracts was estimated by the pad-plate technique with *Bacterium coli* the results were about 50 per cent. higher than those obtained by estimation in tubes with *Lactobacillus leichmannii*. The discrepancy was eliminated if the liver extracts were treated with cyanide during preparation for estimation by the plate method; the values were then lower and in harmony with those of the tube method.—A. M. Copping.

1828

DENTON, C. A. and KELLOGG, W. L. The vitamin B₁₂ activity of eggs and some materials as affected by extraction in the presence of sodium cyanide or sodium bisulfite. *Arch. Biochem. Biophys.*, 1953, **46**, 105-109. [Bur. Animal Indust., U.S. Dept. Agric., Beltsville, Md.]

Addition of cyanide or bisulphite to buffer solutions in making extracts of egg yolk for microbiological estimation of vitamin B₁₂ produced a great increase in the apparent vitamin B₁₂ activity. The presence of cyanide or bisulphite allowed satisfactory recovery of vitamin B₁₂ added to extraction mixtures. The two substances were effective in releasing and protecting vitamin B₁₂ from eggs, day-old chicks and caecal contents

from hens, but did not influence the amount from hen's liver, fishmeal, meatmeal or cow dung.

A. M. Copping.

1829

HEATHCOTE, J. G. The analysis of analogues. A general technique applied to the estimation of cyanocobalamin and hydroxycobalamin in mixtures of the vitamins. *Chem. and Indust.*, 1953, No. 45, 1203. [Distillers Co. (Biochemicals), Ltd., Speke, Liverpool.]

Absorption curves of vitamins B₁₂ and B_{12b} show maxima at 361 and 351 mμ. The measurement of absorption at 356 mμ. for a mixture gives the total of both vitamins in the solution. Addition of benzyl alcohol to an aqueous solution of the vitamins and measurement of absorption at 356 mμ. for each phase gave a coefficient for apparent vitamin distribution between the phases. This coefficient was a function of the composition of the sample and could be compared with results obtained with artificial mixtures as standards.

R. Marshall.

1830

ERICSON, L. E. and NIHLÉN, H. Electrophoretic studies of cobalamins. 1. *Acta chem. scand.*, 1953, **7**, 980-983. [Royal Inst. Technol., Stockholm.]

Electrophoretic measurements showed that vitamin B₁₂ contained acidic and basic groups and had an iso-electric point near 1.9. The mobility of vitamin B₁₂ cyanide complex was greater at high pH (10.55) than that of vitamin B₁₂.—R. Marshall.

1831

JOHNSON, A. W., MILLER, G. W., MILLS, J. A. and TODD, A. R. Chemistry of the vitamin B₁₂ group. 2. Synthesis of 5:6-dimethyl-1-α-D-ribofuranosylbenzimidazole. *J. Chem. Soc.*, 1953, Oct., 3061-3066. [Univ. Chem. Lab., Cambridge.]

1832

NICHOL, C. A. The effect of ascorbic acid on the enzymatic formation of the citrovorum factor. *J. Biol. Chem.*, 1953, **204**, 469-475. [Dept. Pharmacol., Sch. Med., W. Reserve Univ., Cleveland, Ohio.]

Homogenates of liver from chicks which had been on a diet devoid of folic acid, when incubated anaerobically in the presence of ascorbate, were capable of converting 25 per cent. of added pteroylglutamic acid to citrovorum factor. Ascorbic acid could be replaced by glucoascorbic or isoascorbic acid but not by cysteine or glutathione. Ascorbic acid suppressed the enzymic destruction of natural and synthetic citrovorum factor which occurred under aerobic conditions, and also facilitated its active formation.

W. Godden.

13

1833

SAHASHI, Y., IWAMOTO, K. and HAYASHI, J. **Effect of vitamin B₁₂ on metabolism. 1.** *J. Biochem., Tokyo*, 1953, **40**, 245-249. [Biochem. Lab., Fac. Agric., Univ. Tokyo.]

Vitamins B₁ and B₁₂ were estimated in the blood of 2 young heifers before and after work on a treadmill. The exercise caused a decrease of both vitamins in the blood and of the red cell count. Injection of vitamin B₁ alone or with vitamin B₁₂ before exercise protected the animals against the decrease in the blood values for the 2 vitamins. The possible role of vitamin B₁₂ in energy metabolism is discussed in relation to the vitamin B₁ and pyruvate system.—A. M. Copping.

1834

DOCTOR, V. M., WELCH, B. E., PERRETT, R. W., BROWN, C. L., GABAY, S. and COUCH, J. R. **Metabolic interrelationship between folic acid, vitamin B₁₂, and the citrovorum factor.** *Proc. Soc. Exp. Biol. Med.*, 1953, **84**, 29-32. [Dept. Biochem. Nutrit., Texas Agric. Exp. Stat., College Station.]

Day-old chicks in groups of 12 were given a basal diet low in vitamin B₁₂ and folic acid, alone or with supplements per kg. diet of 2, 100 or 400 mg. folic acid, or 30 or 500 µg. vitamin B₁₂. After 4 weeks tests were made of the ability of the liver to synthesise citrovorum factor *in vitro* from added folic acid. Presence of vitamin B₁₂ or folic acid in the diet increased the amount of citrovorum factor synthesised *in vitro*, roughly in proportion to the amounts given. Addition of vitamin B₁₂ and sodium formate *in vitro* to liver preparations from deficient birds had very little effect. The vitamin B₁₂ content of the liver was increased by increasing amounts of vitamin B₁₂ and folic acid in the diet. The possibility is discussed that vitamin B₁₂ and folic acid have specific effects on the enzyme system converting folic acid into citrovorum factor.—A. M. Copping.

1835

DREYER, H. Untersuchungen über den Einfluss von Vitamin B₁₂ und APF auf den Eiweissstoffwechsel. [Effect of vitamin B₁₂ and APF on protein metabolism.] *Arch. Tierernährung*, 1953, **3**, 240-258. [Inst. Tierernährung, Forschungsanst. Landwirtsch., Völkenrode, Brunswick.]

The initial investigation of the effect of vitamin B₁₂ and animal-protein factor on protein metabolism was made on 52 pigs given a fattening ration with or without an adequate supplement of fishmeal. In the ration of low fishmeal content, addition of crystalline vitamin B₁₂ had no beneficial effect, but crude animal-protein factor increased weight gain and feed intake. Metabolism studies

were made with pigs and with rats on diets containing only vegetable protein. Crystalline vitamin B₁₂ had no effect on N retention in any of the tests. In one experiment with young growing pigs animal-protein factor produced some increase in N retention. It had no effect on N retention by rats. A supplement of methionine increased N retention by rats from a diet containing protein from soya bean.

In a final series of experiments, growth response was measured in young rats given protein from soya bean, field bean or pea with a supplement of methionine, cystine, vitamin B₁₂ or animal-protein factor. All the supplements except cystine improved the growth response, and the combination of cystine and animal-protein factor was more effective than animal-protein factor alone. Methionine was the most effective supplement, and it is suggested that the effect of vitamin B₁₂ and animal-protein factor is related to their function in transmethylation systems.—A. M. Copping.

1836

KRUH, J., DREYFUS, J. C. and SCHAPIRA, G. Recherches sur la biochimie de l'hémoglobine à l'aide de fer radioactif. 5. Biosynthèse des hémoglobines *in vitro*. [Studies on the biochemistry of haemoglobin with radio-active iron. 5. Biosynthesis of haemoglobins *in vitro*.] *Bull. Soc. Chim. biol.*, 1953, **35**, 1181-1188. [Lab. Recherches Biochim. Méd., Hôp. Enfants Malades.]

Red blood cells from rabbits made anaemic by bleeding or injection of phenylhydrazine incorporated radio-active Fe into the Hb *in vitro* when suspended in Ringer solution containing antibiotics. By alkaline denaturation or adsorption on alumina the Hb could be separated into 2 fractions, differing in the speed at which they incorporated Fe. The relation between the specific activities acquired by these forms was the opposite of that found in tests *in vivo* (Kruh *et al.*, *Bull. Soc. Chim. biol.*, 1952, **34**, 773; 778; Schapira *et al.*, *ibid.*, 1951, **33**, 812; 822, and others), but became similar to that observed *in vivo* on addition to the medium of bone marrow, liver extract, vitamin B₁₂ or folic acid.—V. R. Jackson.

1837

POLOSA, P., DE FRANCISCIS, G. and NEGRO, L. Variazioni delle resistenze globulari dopo trattamento con acido folico e vitamina B₁₂ nei cani salassati. [Variations in the resistance of the red cells in exsanguinated dogs after treatment with folic acid and vitamin B₁₂.] *Arch. Fisiol.*, 1952-53, **53**, 394-402. [Ist. Patol., Univ. Catania.]

Blood was withdrawn from 5 dogs to the extent of 1/70th of the bodyweight. Two were treated

for 4 days afterwards with 30 mg. daily of folic acid, 2 for 6 days with 15 μ g. daily of vitamin B₁₂, and one had no treatment. The resistance of the red cells to haemolysis in hypotonic saline was measured by the method of Simmel before and after blood-letting. In the untreated dog, the mean resistance of the red cells increased after blood-letting. In the treated dogs, no consistent difference from the untreated was recorded.

E. M. Hume.

1838

COATES, M. E. **The mode of action of antibiotics in animal nutrition.** *Chem. and Indust.*, 1953, No. 50, 1333-1335. [Nat. Inst. Res. Dairying, Univ. Reading.]

1839

COATES, M. E., FORD, J. E., HARRISON, G. F., KON, S. K. and PORTER, J. W. G. **Vitamin B₁₂-like compounds. 1. Vitamin B₁₂ activity for chicks and for different micro-organisms of gut contents and faeces.**

FORD, J. E. and PORTER, J. W. G. **2. Some properties and compounds isolated from bovine gut contents and faeces.** *Brit. J. Nutrition*, 1953, 7, 319-326; 326-337. [Nat. Inst. Res. Dairying, Univ. Reading.]

1. The vitamin B₁₂ activity of rumen contents and of faeces from calves was measured biologically with chicks and microbiologically with *Lactobacillus leichmannii*, *Bacterium coli* and *Euglena gracilis*. The values obtained with *L. leichmannii* were lower than those with *Bact. coli* or *Euglena gracilis* and the values in all microbiological tests were increased when the faeces and gut contents were treated with cyanide in the process of extraction. With chicks the results were lower than those obtained with the micro-organisms.

Incubation of calf faeces produced an increase in the vitamin B₁₂ activity available for chicks, but not in that for micro-organisms. The discrepant results with the different micro-organisms are discussed, and it is suggested that the gut contents and faeces contained vitamin-B₁₂-like compounds with different activities for chicks and for the several organisms.

2. Extracts of the gut contents and faeces of calves made in the presence of cyanide were examined chromatographically, and three factors other than cyanocobalamin were identified and named A, B and C. Factor A was obtained from faeces in crystalline form. Factor B was isolated but not crystallised and only minute amounts of factor C were obtained. Spectrographic examination showed that factor A closely resembled cyanocobalamin and that the absorption spectrum of factor B showed different peaks. Ionophoresis showed that the apparently homologous crystals

of factor A contained small amounts of the other factors.

The vitamin B₁₂ activities of the three factors varied not only according to the organism used but also with the method of test, i.e., whether, in the case of *Bact. coli*, plate or tube culture was used. Factor A was almost as active as cyanocobalamin for *Bact. coli* in plate tests and for *Euglena gracilis*, but relatively inactive in tube tests with *Bact. coli*, and for *L. leichmannii*. Factors B and C were active for *Bact. coli* in plate tests but much less active in tube tests, and for *L. leichmannii* and *Euglena gracilis*.

When fresh calf faeces were incubated, their content of cyanocobalamin increased and that of factor A decreased. In growth studies with *Bact. coli*, factor A and cyanocobalamin appeared to be incorporated unchanged into the cells but factor B was transformed into factor C.—A. M. Copping.

1840

GREGORY, M. E. and HOLDSWORTH, E. S. **The combination of some vitamin B₁₂-like compounds with sow's milk whey and 'intrinsic factor' concentrates.** *Biochem. J.*, 1953, 55, 830-834. [Nat. Inst. Res. Dairying, Univ. Reading.]

In continuation of previous studies on a substance in sow's whey which combined with vitamin B₁₂ (Title 394, Vol. 23), the reaction of other substances with vitamin B₁₂ activity was investigated (see preceding Abst.). Factors A and B and pseudovitamin B₁₂ were purified by repeated ionophoresis and their growth-promoting activity for *Bacterium coli* was estimated as a percentage of that of pure vitamin B₁₂; for factor A the percentage was 66, for factor B 22 and for pseudovitamin B₁₂ 8. The amounts of these 3 factors which were able to combine with a concentrate from sow's whey and with a preparation of intrinsic factor from pig's stomach were proportional to their vitamin B₁₂ activities.—A. M. Copping.

1841

SAHASHI, Y., IWAMOTO, K., MIKATA, M., NAKAYAMA, A., SAKAI, H., TAKAHASHI, J., HAYASHI, J., SENO, N., AKATSUKA, T., MIKI, T., HARASHIMA, K. and MATSUMOTO, R. **Biosynthesis of vitamin B₁₂ in various organisms. 1. J.** *Biochem., Tokyo*, 1953, 40, 227-244. [Biochem. Lab., Fac. Agric., Univ. Tokyo.]

The failure of vitamin B₁₂ synthesis by actinomycetes in the rumen was investigated as a cause of *kuwazu*, *kuiyami* and *kiriyo* disease in cattle. No actinomycetes capable of synthesising vitamin B₁₂ were identified in the faeces of animals suffering from these conditions. Intramuscular injection of vitamin B₁₂ cured the diseases. The possibility is suggested that fluorine may inhibit the synthesis

of vitamin B₁₂ by the rumen flora and thus disturb the whole metabolic system.

In experiments with rats on diets lacking vitamin B₁₂ no evidence of deficiency was obtained and no anaemia occurred. See also Abst. 4157, Vol. 23.

In chicks, actinomycetes actively synthesising vitamin B₁₂ were found in the droppings, but none was isolated from any part of the alimentary tract and none from fresh droppings. Actinomycetes administered to chicks did not prevent the results of lack of vitamin B₁₂.

Examination of silkworm ova, larvae, pupae and moths showed the presence of vitamin B₁₂ at all stages of development, but there was no vitamin B₁₂ in the mulberry leaves forming the sole diet.

A. M. Copping.

1842

PETERSON, G. E., DICK, E. C. and JOHANSSON, K. R. **Influence of dietary aureomycin and carbohydrate on growth, intestinal microflora and vitamin B₁₂ synthesis of the rat.** *J. Nutrition*, 1953, **51**, 171-189. [Dept. Bacteriol., Univ. Minnesota, Minneapolis.]

Purified basal diets with sucrose or dextrin as carbohydrate, and soya bean protein, and lacking vitamin B₁₂, were given to weanling female rats for 7 days, after which the rats on each diet were divided into 4 groups having 25 µg. vitamin B₁₂ per kg. diet, or 100 p.p.m. crystalline aureomycin hydrochloride or both, or no supplement. Growth was followed for 42 days and the microflora of pooled faeces from each group was examined 16, 40, 112 and 192 hr. after the experimental diets were first given, and of the ileal and caecal contents after 42 days.

The vitamin B₁₂ content of the kidneys and liver at the end of the experiment was greater in animals having vitamin B₁₂ but not in those having aureomycin. The concentration of vitamin B₁₂ in the contents of the caecum, ileum and colon was increased in rats having aureomycin. There was a positive correlation between the growth response and the concentration of free vitamin B₁₂ in the intestinal contents. Inclusion of aureomycin in the diet increased the growth of rats whether vitamin B₁₂ was given or not.

The nature of the intestinal flora was affected by the carbohydrate constituent of the diet. Aureomycin in the sucrose diet gave increased counts of *Proteus*, enterococci and aureomycin-resistant bacteria, decreased counts of *Clostridium perfringens* and lactobacilli, and no change in the numbers of coliform bacteria. With dextrin the coliform bacilli increased, *C. perfringens* was not affected and lactobacilli were only slightly less numerous. The effect of aureomycin was seen within 40 hr.

The bearing of the results on the problems of

intestinal synthesis and absorption of vitamin B₁₂ is discussed.—A. M. Copping.

1843

BARBER, R. S., BRAUDE, R., KON, S. K. and MITCHELL, K. G. **Antibiotics in the diet of the fattening pig.** *Brit. J. Nutrition*, 1953, **7**, 306-319. [Nat. Inst. Res. Dairying, Univ. Reading.]

Aureomycin, penicillin and aureomycin residues were studied in 4 experiments. In the first, pigs received a diet containing 10 per cent. fishmeal and the supplements caused only a slight increase in growth rate. In the second test, antibiotic supplements added to diets containing only vegetable proteins raised growth and feed utilisation to equal those of pigs having 10 per cent. animal protein in the diet. The third experiment was complicated by an undiagnosed illness, from which recovery took place; it affected all the animals except those receiving penicillin, which made the best weight gains whether their diets contained animal protein or solely vegetable protein. In the fourth experiment, where the Lehmann system of giving bulky fodder was used, the rate of gain was improved by the antibiotic supplements and the best results were obtained when the diets contained 2.5 per cent. fishmeal.

Some of the pigs in the last 3 experiments developed coughs which yielded to sulphonamides, but were not affected by the antibiotics in the diets. Urine, faeces and intestinal contents were examined and, though the presence of antibiotic could be demonstrated throughout the intestinal tract, no demonstrable change in gut flora occurred. The antibiotics were effective in the presence and absence of vitamin B₁₂ in the diet, and examination of the stomach, duodenum, caecum and colon of pigs on different diets showed no marked difference in vitamin B₁₂ content. The vitamin B₁₂ stores in the liver were greater in pigs receiving the vitamin in their diets. The vitamin A stores in the liver were not affected by vitamin B₁₂ or antibiotics in the diets.

The carcasses were subjected to detailed examination and the results showed that consumption of antibiotics had no effect on the quality of the bacon.—A. M. Copping.

1844

MIRONE, L. and WADE, E. M. **Vitamin B₁₂ and cobalt chloride in growth and reproduction of four strains of mice.** *Amer. J. Physiol.*, 1953, **175**, 11-12. [Dept. Nutrit., Univ. Georgia, Athens.]

Addition of 50 µg. vitamin B₁₂ or of 58 mg. cobalt per kg. to a purified diet containing 23 per cent. casein did not have any significant effect on growth or reproduction in mice of the C₃H, C₅₇,

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CF, or dba strains. Experiments were made with 80 female mice which received the purified diet from weaning and with 52 which had stock diet until the time of mating. The reproductive performance was better in the latter group, and was not improved by the supplement of vitamin B₁₂.

A. M. Copping.

1845

LASSITER, C. A., WARD, G. M., HUFFMAN, C. F., DUNCAN, C. W. and WEBSTER, H. D. **CrySTALLINE vitamin B₁₂ requirement of the young dairy calf.** *J. Dairy Sci.*, 1953, **36**, 997-1005. [Dept. Dairy, Michigan Agric. Exp. Stat., East Lansing.]

In studies with 23 calves which from 48 hr. after birth were given a synthetic milk diet with alpha protein, a soya bean preparation, as the sole protein, growth ceased with loss of appetite and general poor condition if no vitamin B₁₂ was given. Average daily weight gains were measured in calves without, and with 10, 20 or 40 µg. vitamin B₁₂ per kg. dry matter of the diet. A maximum response was obtained with 40 µg. and a moderate response with 20 µg. Some batches of alpha protein proved unsatisfactory for calf feeding, and the effect was attributed to presence of a toxic factor. The observation was confirmed in tests with rats, which also showed poor growth on diets containing the unsatisfactory alpha protein.

A. M. Copping.

1846

CARLSON, C. W., GUENTHNER, E., KOHLMAYER, W. and OLSON, O. E. **Some effects of selenium, arsenicals, and vitamin B₁₂ on chick growth.** *Poultry Sci.*, 1953, **32**, 891. *Proc.* [S. Dakota Agric. Exp. Stat., College Station.]

1847

GERLICH, N. and REMY, R. **Aftiperniciös wirk-same Stoffe bei der Bleianämie. [Substances with anti-pernicious-anaemia activity in lead anaemia.]** *Arch. exp. Pathol. Pharmacol.*, 1953, **220**, 351-357. [Städt. Krankenhaus, Bielefeld.]

Groups of 9 male rabbits weighing from 2 to 3 kg. were given lead acetate intravenously for 3 consecutive days, and certain groups received in addition liver extract or vitamin B₁₂. With Pb alone the rabbits developed anaemia which reached its maximum on the fifth day. When the combined injections were given, the rate of development and severity of the anaemia were significantly reduced. The effect of the liver extract was equal to that of a dose of vitamin B₁₂ 3 or 4 times greater than its ascertained vitamin B₁₂ content. Folic acid similarly administered had much less effect than liver extract or vitamin B₁₂. Cobalt given with the lead, in amounts equal to those in the doses of vitamin B₁₂ found to be protective, had

no effect on the anaemia but, on the third day after a large dose, 0.08 mg. per kg. bodyweight, both the red cells and the Hb began to rise, and by the fifth day had risen from a minimum value of 2.4 to 4.0 million and to 70 from 45 per cent., respectively.—L. Wills.

1848

LABÒ, G., GIANNI, A. M. and DESSI, P. **Azione della vitamina B₁₂ in corso di avvelenamento con formiato di allile. [Effect of vitamin B₁₂ on poisoning with allyl formate.]** *Acta vitaminol.*, 1953, **7**, 197-199. [Ist. Clin. Med., Univ. Bologna.] English, French, German and Spanish summaries.

Two groups of 9 rats weighing about 85 g. were maintained on a complete diet, and were given on alternate days 0.014 ml. per kg. bodyweight of allyl formate in 10 per cent. oily solution. One group received in addition daily 150 µg. vitamin B₁₂ per kg. bodyweight. Three rats from each group were killed after 18, 40 and 44 days, and lipids were estimated in the liver. In the liver the histological picture of injury was much less severe in the rats given vitamin B₁₂, and the concentration of fat was not much more than half that in the untreated rats.—E. M. Hume.

1849

SREENIVASAMURTHY, V., NAMUDRIPAD, V. K. N. and IYA, K. K. **Further studies on the vitamin B₁₂ activity of milk.** *Indian J. Dairy Sci.*, 1953, **6**, 105-109. [Indian Dairy Res. Inst., Bangalore.]

Vitamin B₁₂ in its heat-stable form of cyanocobalamin and its labile form of hydroxocobalamin was estimated with *Lactobacillus lactis* Dorner in milk from cows of 4 breeds and in human milk. In human milk the activity was mainly present as cyanocobalamin and ranged from 0.055 to 0.16 µg. per ml. The values for cow's and buffalo's milk were higher and ranged from 2.7 to 9.0 µg. per ml., with much hydroxocobalamin included in the total. The milk from crossbred cows was generally richer in vitamin B₁₂ than milk from Gir, Sindhi or Tharparkar breeds.—A. M. Copping.

1850

SJÖSTRÖM, A. G. M., NEUJAHN, H. Y. and LUNDIN, H. **Vitamin B₁₂, folic acid and folinic acid factors in digested municipal sludge.** *Acta chem. scand.*, 1953, **7**, 1036-1040. [Royal Inst. Technol., Stockholm.]

Sludge from each of three sewage plants was found to contain growth factors for *Lactobacillus lactis* Dorner, *Leuconostoc citrovorum* and *Streptococcus faecalis*. The nature of the substances was investigated by chromatography or ionophoresis in conjunction with bio-autographic methods. Large

amounts of vitamin B₁₂ activity were present as hydroxocobalamin, factors A, B and C and pseudo-vitamin B₁₂. The amount of vitamin B₁₂ activity increased during anaerobic digestion of the sludge. Deoxyribosides and factors of the folic acid

group, including folinic acid, also were identified in fresh and in digested sludge, but no evidence was obtained of their production during the digestion process.—A. M. Copping.

See also Absts. 2140, 2562.

OTHER B VITAMINS

1851

RABBI, A., PICCIONI, M., DINA, A. and MORUZZI, G. Manifestazioni carenziali da FPA: insorgenza di neoplasie. [Signs of deficiency of

the animal-protein factor: occurrence of neoplasms.] *Boll. Soc. ital. Biol. sper.*, 1953, 29, 325-326. [Ist. Chim. Biol., Univ. Bologna.]

VITAMIN C (ASCORBIC ACID)

1852

SCHMALL, M., PIFER, C. W. and WOLLISH, E. G. **Determination of ascorbic acid by a new colorimetric reaction.** *Anal. Chem.*, 1953, 25, 1486-1490. [Products Control Lab., Hoffmann-La Roche, Inc., Nutley, N.J.]

The method is based on the fact that ascorbic acid reacts with diazotised 4-methoxy-2-nitro-aniline in acid solution in such a way that when the solution is made alkaline a deep blue colour is obtained with maximum absorption at 570 mμ. The reaction was highly specific for ascorbic acid, depending on its enediol grouping and not directly on its reducing power. Dehydroascorbic and 2:3-diketogulonic acids and the vitamins normally present in multivitamin preparations did not interfere with the estimation. The method was rapid, simple and suitable for routine work, and in accuracy compared favourably with conventional procedures.—W. Godden.

separation on a paper chromatogram. *Biochem. J.*, 1953, 55, 821-823. [Low Temperature Res. Stat., Univ. Cambridge.]

L-Ascorbic acid and allied compounds were separated on a paper chromatogram by the use of 2 solvents, *n*-butanol saturated with water and oxalic acid, and phenol similarly saturated. The second solvent gave a clear-cut separation of L-ascorbic acid and D-araboascorbic acid. Details are given for the estimation of enediols from plant and animal tissues. Recovery of L-ascorbic acid and D-araboascorbic acid added to rat's urine or extracts of cress seedlings was 85 per cent.

W. Godden.

1855

SONDHEIMER, E. and KERTESZ, Z. I. **Participation of ascorbic acid in the destruction of anthocyanin in strawberry juice and model systems.** *Food Res.*, 1953, 18, 475-479. [New York State Agric. Exp. Stat., Cornell Univ., Geneva.]

1853

HEIMANN, W., STROHECKER, R. and MATT, F. Zur Bestimmung der Ascorbinsäure auf papierchromatographischem Weg. [Estimation of ascorbic acid by paper chromatography.] *Ztschr. Lebensmittel - Untersuch. Forsch.*, 1953, 97, 263-270. [Inst. Lebensmittelchem., Tech. Hochsch., Karlsruhe.]

With the upper layer of a mixture of butanol, acetic acid and water as solvent, and molybdate solution as indicator, it was possible by ascending paper chromatography to separate ascorbic acid from the numerous substances which interfere in the ordinary estimation. An exact separation of isoascorbic acid from ascorbic acid, in the period of from 5 to 6 hr. adopted, was not possible owing to the similarity of their *R_F* values. The method could be used for quantitative estimations.

W. Godden.

1856

GUGGENHEIM, K., LEIBOWITZ, J. and RAKOVER, D. **Comparative observations on the chemical properties and biological activities of L-ascorbic and D-isoascorbic acids.** *Biochem. J.*, 1953, 55, 388-392. [Lab. Nutrit., Hadassah Med. Sch., Hebrew Univ., Jerusalem.]

Ascorbic and isoascorbic acids were equally effective in detoxifying potassium cyanide, phenol and tetanus toxin and in increasing the urinary excretion of citrovorum factor by rats after injection of folic acid. They also showed similar abilities to combine with potassium cyanide and phenol in aqueous solution. It is concluded that, since the antiscorbutic activity of isoascorbic acid is negligible, that of ascorbic acid cannot be explained on the basis of its detoxifying activity.

W. Godden.

1857

ROY, S. C., ROY, S. K. and GUHA, B. C. **Studies in certain aspects of the bio-synthesis of L-ascorbic acid.** *Ann. Biochem. Exp. Med.*, 1951, 11, 73-112. [Dept. Appl. Chem., University Coll. Sci., Calcutta.]

N.A. and R., April 1954

1854

CHEN, Y. T., ISHERWOOD, F. A. and MAPSON, L. W. **Quantitative estimation of ascorbic acid and related substances in biological extracts by**

Part of the paper is a more detailed account of work already published (Abst. 2885, Vol. 16). The rise in urinary excretion of vitamin C in rats receiving chloretone daily was not affected by a high intake of detoxicating agents such as glycine or by removal of the pancreas or adrenal glands. Of the dehydrogenases studied in brain and liver tissues only those which dehydrogenated pyruvate and lactate were inhibited by previous administration of chloretone. Injection of enzyme inhibitors such as Na malonate, iodoacetate or fluoride did not affect the urinary excretion of vitamin C in normal rats or those receiving chloretone. The tissue reserves of vitamin C in normal rats was appreciably reduced by deficiency of vitamin B₁ or riboflavin, but vitamin C depletion had no effect on the vitamin B₁ content of the tissues. The urinary excretion of both citric acid and vitamin C fell to zero in vitamin-B₁-deficient rats, and was not raised by administration of chloretone. Administration of vitamin B₁ alone caused a rise in the citric acid excretion, but administration of both chloretone and vitamin B₁ was necessary to bring about a rise in urinary vitamin C.

W. Godden.

1858

NIKOLAEV, R. P., POVOLOTSKAYA, K. L. and VODOLAZSKAYA, N. A. Biologicheskaya tsennost razlichnykh kontsentratsionnykh preparatov vitamina C. [The biological value of different concentrates and preparations of vitamin C.] *Biokhimiya*, 1953, **18**, 169-174. [Vsesoyuz. Nauch.-Issled. Vitamin. Inst., Moscow.]

Experiments on guineapigs showed that vitamin C from natural sources such as rose hips was more effective in preventing scurvy and haemorrhage than pure synthetic vitamin C alone, but when vitamin P or natural products containing vitamin P or substances with vitamin P activity were given with synthetic vitamin C the results obtained were almost identical. Concentrates made from rose hips and green walnuts not only protected guineapigs from scurvy and haemorrhage but improved growth, and often led to increased accumulation of vitamin C in the liver and adrenal glands. Dog-rose hips were of great biological value as source of vitamin C and vitamin P. Vitamin P activity was demonstrated in tea extracts and in the flavone extracts from the dog-rose hip.—W. Hughes.

1859

MARCH, B. and BIELY, J. The effect of ascorbic acid on the growth rate of chicks. *Poultry Sci.*, 1953, **32**, 768-774. [Poultry Nutrit. Lab., Univ. British Columbia, Vancouver.]

Chicks were given diets of natural ingredients, adequate or low in folic acid and with or without added ascorbic acid. Some chicks received also an antibiotic or *p*-aminobenzoic acid or both.

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When the basal diet was low in folic acid, ascorbic acid increased growth, though to a less extent than folic acid. The growth-stimulating effect of ascorbic acid appeared to depend on the composition of the diet. When the diet contained no added fat or when herring oil was included, only a slight response to ascorbic acid was observed; when it contained cottonseed oil or tallow, the response was greater. Growth was increased by adding penicillin to diets adequate or low in folic acid. When the diet was low in folic acid *p*-aminobenzoic acid increased growth, but a combination with penicillin of *p*-aminobenzoic acid and ascorbic acid, separately or together, stimulated growth more than any of the supplements alone. On a diet considered to be adequate, aureomycin alone or with *p*-aminobenzoic acid did not improve growth, but when aureomycin was given with ascorbic acid growth was slightly but consistently increased.—E. M. Cruickshank.

1860

TURESKY, S. S. and GLICKMAN, I. A histochemical evaluation of gingival healing on adequate and vitamin C deficient diets. *J. Dent. Res.*, 1953, **32**, 688. *Proc. [Dent. Sch., Tufts Coll., Boston, Mass.]*

1861

LINDAN, O. and WORK, E. Experimental liver necrosis in rats. 1. Changes in liver, blood and spleen glutathione and ascorbic acid levels in dietetic liver necrosis. 2. The levels of glutathione and ascorbic acid in livers subjected to acute circulatory congestion in relation to the levels found in dietetic liver necrosis. *Biochem. J.*, 1953, **55**, 554-562; 562-566. [University Coll. Hosp. Med. Sch., London, W.C.1.]

1. With the necrosis-producing diet and conditions of feeding previously reported (Abst. 822, Vol. 21) it was found that in weanling rats the content of reduced glutathione in the liver fell in 13 days to one-quarter, and when necrosis developed to one-tenth, of the normal value. Significant changes occurred in the ratio of oxidised to reduced glutathione. The amount of ascorbic acid was slightly reduced in the pre-necrotic livers and it was absent from necrotic livers. The ratio of total glutathione N to N.P.N. in both pre-necrotic and necrotic livers was about one-third of the normal value. Addition to the experimental diet of cystine or cystine and methionine maintained liver glutathione at its normal value, but tocopherol had no such effect, though it prevented necrosis. The value for reduced glutathione in the spleen was halved and did not change further when necrosis supervened; addition of sulphur-containing amino-acids to the diet restored the value to normal.

The values for reduced glutathione in blood showed a similar trend. The amount of ascorbic acid in the spleen was normal even when it had disappeared from the liver. Pre-necrotic livers had a subnormal water and N content but a raised fat content. Glycogen values were normal.

2. In the livers of adult rats weighing 200 g. acute circulatory congestion was produced by ligation of the base of the left lobe. In some the lobe was amputated and left to autolyse in the abdominal cavity and in others the excised lobe was removed to autolyse *in vitro*. The ligated livers showed values for reduced glutathione, ascorbic acid, N.P.N. and total N, water and glycogen similar to those found in necrosis of dietary origin as reported above. The amputated lobes autolysing in the body cavity gave similar results, but the behaviour of those autolysing *in vitro* showed no resemblance to that of necrotic livers. It is suggested, therefore, that the values for glutathione and ascorbic acid found in liver necrosis caused by diet could be the result of changes occurring in a dead or dying liver left in the body, and were not specific effects of the diet.

W. Godden.

1862

WADHWANI, T. K. **Metabolism of fluorine. Absorption, retention, distribution and elimination of fluorine, and its effect on the vitamin C content of different tissues, and on the iodine content of thyroids of rats and monkeys.** *J. Indian Inst. Sci.* [A], 1953, **35**, 354-362. [Sect. Pharmacol., Dept. Biochem., Indian Inst. Sci., Bangalore.]

Young growing rats were maintained on a diet of cottonseed globulin, gelatine, starch, salts and vegetable fat, with vitamin supplements, choline and cystine. The diet contained 0.00045 per cent. F and each rat received daily 2 mg. NaF in water by mouth 1 hr. before feeding. F balances were estimated weekly. After 20 weeks 3 rats were killed and the total F was estimated; in 3 other rats the F content of different tissues was estimated. Of the total of 129.75 mg. F ingested in 20 weeks, 2.45 mg. were in the faeces and 53.96 mg. in the urine, leaving a balance of 73.34 mg. In similar rats on a diet low in Ca and P the balance over a 3-week period was 8.42 mg. from 19.5 mg. ingested. In the first group of animals the average total F recovered in the body, mainly in the skeleton, was 68.80 mg. From some of the rats which had received the experimental diet for 20 weeks the daily dose of 2 mg. NaF was then withheld for 12 weeks, during which time 19.8 mg. F were recovered from the faeces and urine, leaving 51.97 mg. apparently in the body. Total F in the body at death amounted to 47.52 mg. The discrepancies are attributed to errors in the weekly estimations.

In rats and monkeys chronic fluorosis of the same type caused a reduction in the vitamin C content of the soft tissues and a rise in the percentage of I in the thyroid gland, both being more marked in monkeys than in rats.

W. Godden.

1863

BREIDENBACH, A. W. and RAY, F. E. **Gastric ascorbic acid in the gastritis guinea pig.** *Science*, 1953, **118**, 557. [Cancer Res. Lab., Univ. Florida, Gainesville.]

Gastritis induced in guineapigs by direct contact of eugenol with the gastric mucosa produced a decrease of 44 per cent. in the ascorbic acid content of the stomach tissue compared with a decrease of 13 per cent. previously found for the rat (Abst. 2117, Vol. 22).—W. Godden.

1864

SOKOLOFF, B., EDDY, W. H., POWELLA, R. BEAUMONT, J. and RELOS, H. **Ascorbic acid analog in experimental cancer.** *Cancer Res.*, 1953, **13**, 639-645. [S. Bio-Res. Lab., Florida Southern Coll., Lakeland.]

D-Glucoascorbic acid added as 1 or 2 per cent. of a Sherman La Mer scorbutogenic diet produced no apparent toxic effect, such as diarrhoea, alopecia or haemorrhage, in rats and mice, but the ascorbic acid concentration in the blood plasma, liver, spleen and adrenal glands fell nearly to zero in 20 days. Intraperitoneal injection of 250 mg. D-glucoascorbic acid per kg. daily did not retard the growth of mouse sarcoma 180 and only slightly inhibited that of Crocker rat carcinoma and mouse adenocarcinoma E 0771. The Sherman La Mer diet with 1 or 2 per cent. D-glucoascorbic acid for 4 weeks considerably retarded the growth of the Crocker rat carcinoma and mouse adenocarcinoma. It retarded also the growth of liposarcoma in guineapigs, but not if the diet was supplemented with an adequate amount of ascorbic acid. In rats on a purified diet containing no ascorbic acid, 1 or 2 per cent. of D-glucoascorbic acid added to the diet lowered the conversion of pteroylglutamic acid to citrovorum factor, but had no effect if 0.1 mg. ascorbic acid was given daily.

W. Godden.

1865

SANFORD, P. E., WEI, A. J. and CLEGG, R. E. **Vitamin C and tyrosine metabolism in the chicken.** *Poultry Sci.*, 1953, **32**, 922. *Proc.* [Kansas State Coll., Manhattan.]

1866

PATTERSON, J. W. **Prevention of dehydroascorbic acid diabetes by atropine.** *Proc. Soc. Exp. Biol. Med.*, 1953, **83**, 850-851. [Dept. Anat., Sch. Med., W. Reserve Univ., Cleveland, Ohio.]

1867

ARNDT, C. U. Tierexperimentelle Untersuchungen über die therapeutische und prophylaktische Wirksamkeit der l-Askorbinsäure bei bakteriellen Infektionen. [Animal experiments on the therapeutic and prophylactic action of l-ascorbic acid in bacterial infections.] *Ztschr. ges. inn. Med.*, 1953, **8**, 654-658. [Hyg. Inst., Karl Marx Univ., Leipzig.]

Groups of guineapigs were infected by intraperitoneal injection with *Micrococcus tetragenus* in the same dose, and were given a normal or a scorbutogenic diet; vitamin C was added to both normal and scorbutogenic diet in some series. One group had the deficient diet replaced by the normal diet at the time of infection. The highest death rate occurred in the group having normal diet with added vitamin C, and no significant difference was evident between the other groups. Addition of vitamin C to the normal or deficient diet did not prolong survival. It thus seemed that vitamin C had an unfavourable effect on this infection. It is suggested that the prophylactic use of vitamin C in infections should be advised only in states of deficiency and that even then it is of doubtful value.—A. M. Copping.

1868

HOCHMAN, A. and BLOCH-FRANKENTHAL, L. The effect of low and high X-ray dosage on the ascorbic acid content of the suprarenal. *Brit. J. Radiol.*, 1953, **26**, 599-600. [Radium Inst., Hadassah-Univ. Hosp., Jerusalem.]

After irradiation of the whole body with from 50 to 200 r or from 400 to 1000 r, the loss of ascorbic acid from the adrenal glands of rats was about the same, from 20.2 to 26.7 per cent.

W. Godden.

1869

SEVY, R. W. and OHLER, E. A. Effect of renin on adrenal ascorbic acid concentration in rats. *Amer. J. Physiol.*, 1953, **174**, 471-474. [Dept. Physiol., Univ. Illinois Coll. Med., Chicago.]

1870

OHLER, E. A. and SEVY, R. W. Effect of pressor amines and adrenergic blockade on adrenal ascorbic acid concentration in rats. *Amer. J. Physiol.*, 1953, **175**, 285-288. [Dept. Physiol., Univ. Illinois Coll. Med., Chicago.]

1871

MONIER, M. M. and WEISS, R. J. Increased excretion of dehydroascorbic and diketogulonic acids in urine of rats after standardised temperature shock. *Proc. Soc. Exp. Biol. Med.*, 1953, **84**, 93-94. [Dept. Biochem., Sch. Med., George Washington Univ., Washington, D.C.]

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1872

DONE, A. K., ELY, R. S., HEISELT, L. R. and KELLEY, V. C. Circulating 17-hydroxycorticosteroids in ascorbic acid-deficient guinea pigs. *Proc. Soc. Exp. Biol. Med.*, 1953, **83**, 722-724. [Lockhart Mem. Lab., Dept. Paediat., Coll. Med., Univ. Utah, Salt Lake City.]

In guineapigs with severe ascorbic acid deficiency, the value for circulating 17-hydroxycorticosteroids was on the average 301.9 ± 43.03 μ g. per 100 ml. and for adrenal ascorbic acid 0.87 ± 0.018 mg. per 100 g., compared with 68.7 ± 19.35 and 35.8 ± 2.66 for similar animals given ascorbic acid for 5 days before being killed, and 32.9 ± 4.60 and 35.5 ± 3.86 for normally fed controls.—W. Godden.

1873

BACCHUS, H. Relation of ascorbic acid nutrition to the *in vitro* metabolism of cortisone by surviving liver tissue. *Endocrinology*, 1953, **53**, 441-446. [Res. Lab., Dept. Physiol., Sch. Med., George Washington Univ., Washington, D.C.]

With the method of Porter and Silber (*J. Biol. Chem.*, 1950, **185**, 201) for the estimation of cortisone, it was found that the ability of isolated liver slices from rats or guineapigs to maintain the 17-hydroxy-20:21-diketo structure of cortisone increased when the animals received excess of ascorbic acid and decreased when they were deprived of it. The addition of ascorbic acid to the incubation mixture of livers from deficient animals had no effect.—W. Godden.

1874

CLAYTON, B. E. and PRUNTY, F. T. G. The relation of adrenocortical function to scurvy in guinea-pigs. The effect of exogenous ACTH and adrenalectomy. *J. Endocrinol.*, 1953, **9**, 370-378. [Dept. Chem. Pathol., St. Thomas's Hosp. Med. Sch., London.]

In support of earlier work (Abst. 4910, Vol. 21), it is shown that the gradual rise in the urinary excretion of 17-ketosteroids by guineapigs on a diet deficient in vitamin C, which reaches a peak at the terminal phase, was continued to a still higher level if the animals received injections of adrenocorticotrophic hormone during the last few days when they were losing weight. Animals from which both adrenal glands had been removed and which were deprived of ascorbic acid lost weight rapidly and died in from 3 to 7 days without showing any increase in urinary 17-ketosteroids, or any response in this respect to adrenocorticotrophic hormone.—W. Godden.

1875

- KÜCHMEISTER, H., PIRTKIEN, R. and STEEGE, H. Die Wirkung von Conteben und Vitamin C auf die Überlebenszeit epinephrektomierter Goldhamster. [The effect of Conteben and vitamin C on the survival of adrenalectomised golden hamsters.] *Ztschr. ges. exp. Med.*, 1953, **122**, 35-38. [2. Med. Klin., Univ. Hamburg, Eppendorf.]

1876

- JOHANSSON, G. A. Cortison, ascorbinsyra och amyloidbildning. Kliniska reflexioner till Teilums synpunkter på sambandet dem emellan. [Cortisone, ascorbic acid and the formation of amyloid. Clinical reflections on Teilum's views of the relation between them.] *Nord. Med.*, 1953, **50**, 1605-1610. [Sjukhem, Stockholm.] English summary.

1877

- SCHILLING, J. A., RADAKOVICH, M., FAVATA, B. V., FILER, L. J. (Jr.) and JESPERSEN, H. W. The relationship of vitamin C and ACTH in experimental wounds. *Surg. Gynecol. Obstet.*, 1953, **97**, 434-438. [Dept. Surg., Sch. Med. Dent., Rochester, N.Y.]

Wound healing in male guineapigs was studied by means of subcutaneously implanted tantalum wire mesh cylinders, by measurement of planimeter tracings from photographs of wound closure and by measurement of tensile strength of primarily closed linear wounds. There were 6 groups, 4 on normal diet alone or with added vitamin C or injected adrenocorticotrophic hormone (ACTH) or both, and 2 on scorbutogenic diet alone or with ACTH. There was no significant effect of ACTH on the healing process or any combined effect of it with vitamin C. The vitamin C level in the blood serum showed irregular fluctuations in phases of wound healing; in the tissue juice from the mesh cylinders the fluctuations were much greater and seemed to be independent of the administration of vitamin C or ACTH.—W. Godden.

1878

- PETROV-MASLAKOV, M. A. [Modification in the reactivity of the organism to placental proteins in vitamin C deficiency.] *Akusherstvo Ginekol.*, 1952, No. 3, 23.

1879

- KUDRYAVTZEVA, N. G. [Effect of adrenal hormone on the content of ascorbic acid in the brain.] *Fiziol. Zh. S.S.S.R. Sechenova*, 1953, **39**, 357.

1880

- COSTA, A. and RIBEIRO, O. F. Sobre o teor de ácido ascórbico no sangue total de equínos

(P.S.) da vila hípica do Jockey Club de São Paulo. [Ascorbic acid in whole blood of thoroughbred racehorses of the Jockey Club, São Paulo.] *Rev. Fac. Med. vet., São Paulo*, 1952, **4**, 513-522. [Dept. Quim. Ord., Univ. São Paulo, Brazil.] English summary.

Ascorbic acid was estimated by the diphenylhydrazine method in whole blood from 117 thoroughbred racehorses aged from 2 to 8 years. The horses were in active training and received rations of cereals and green fodder of ample vitamin C content. No significant difference was found between the average values for males and females; the mean for the whole group was 0.633 ± 0.013 mg. per 100 ml. blood.—A. M. Copping.

1881

- GYLLENBERG, H., ROSSANDER, M. and ROINE, P. Askorbiinihapon ja dehydroaskorbiinihapon määristä maidossa eri käsittely- ja säilytysvaihkeissa. [Ascorbic and dehydroascorbic acid in milk under different conditions of handling and storage.] *Maataloust. Aikakausk.*, 1953, **25**, 99-112. [Dept. Nutrit. Chem., Univ. Helsinki.] English summary.

The vitamin C in freshly drawn milk was almost entirely ascorbic acid. Exposure to diffuse daylight caused oxidation to dehydroascorbic acid but no further change. In direct sunlight the dehydroascorbic acid rapidly disappeared, with an abrupt fall in total vitamin C potency. Aeration of milk accelerated the oxidation. The content of total vitamin C in market milk was about the same in summer, autumn and winter, but the proportion present as ascorbic acid was distinctly less in summer. Storage at 0° C. caused marked oxidation of ascorbic acid but not of dehydroascorbic acid; at 18° C. most of the latter disappeared, but loss of ascorbic acid was small. (From summary.)

W. Godden.

1882

- ORR, K. J., DENNING, H. and MILLER, C. D. The sugar and ascorbic acid content of papayas in relation to fruit quality. *Food Res.*, 1953, **18**, 532-537. [Food and Nutrit. Dept., Univ. Hawaii, Honolulu.]

Samples of Solo papaya, Line No. 5, were collected at monthly intervals from February to December 1950, analysed for ascorbic acid, total sugars, moisture and pH, and graded organoleptically. Ascorbic acid, sugars and the scores for colour, flavour and sweetness showed significant monthly changes, the fruit having the best quality from May to November when the content of sugar and ascorbic acid was highest. The position of the fruit on the tree appeared to affect its content of sugar but not of ascorbic acid or its organoleptic score.—W. Godden.

1883

SIDDAPPA, G. S. Vitamin C in amte kayi (Indian hog plum). *Bull. Central Food Technol. Res. Inst. Mysore*, 1953, **2**, 286-287. [Div. Fruit Technol., C.F.T.R.I., Mysore.]

The true ascorbic acid content of the fully mature green fruit of the Indian hog plum, *Spondias pinnata*, Kurz, was from 6 to 11 mg. per 100 g. fresh material.—W. Godden.

1884

HELLSTRÖM, V. Die Haltbarkeit des Vitamins C bei der Zerkleinerung von rohen Vegetabilien. [Stability of vitamin C in shredded raw vegetables.] *Ztschr. Vitamin-, Hormon- Fermentforsch.*, 1952-53, **5**, 98-113. [Vitaminabt., Staatl. Inst. Volksgesundh., Tomtebodav., Stockholm.] French and English summaries.

The literature is reviewed. White cabbage and tomatoes were mashed to a fine pulp in a Turmix apparatus, which resembles a Waring Blendor, and stored for periods of up to 24 hr. The values for the uncut vegetables were obtained by mashing in the presence of metaphosphoric acid. Ascorbic acid, dehydroascorbic acid and total ascorbic acid were estimated by indophenol titration before and after treatment with H_2S . The values for free ascorbic acid were decreased in mashed vegetables even when fresh, but the total ascorbic acid activity was only slightly decreased after 10 min. in the mixer. When the mashed cabbage had stood for 1 hr., from 20 to 30 per cent. of the total ascorbic acid was lost. In the tomato pulp there was little loss in 4 hr. and only about 40 per cent. in 24 hr. Cabbage lost up to 90 per cent. of its total ascorbic acid activity in 24 hr. Addition of lemon juice to chopped cabbage or tomato decreased the loss of ascorbic acid during storage; it had a protective effect on both ascorbic and dehydroascorbic acid, which appeared to be related to its action in lowering the pH of the chopped vegetables.—A. M. Copping.

1885

PAUL, P. C., ROBERTSON, W. F., CASE, W. H. and MARSHALL, R. E. Nutritive value of canned foods. **44. Enzyme inactivation and ascorbic acid retention in vegetables blanched and held under different conditions prior to canning.** *Food Technol.*, 1952, **6**, 464-467. [Dept. Foods Nutrit., Michigan State Coll.]

A comparison was made of the effects of blanching at high temperature, 200° to 212° F., and at low temperature, 170° to 180° F., and of treatment after blanching and before canning on the inactivation of catalase and peroxidase, and on the ascorbic acid content of asparagus, peas, green beans, Lima beans and spinach. The results for ascorbic acid

are in general agreement with those of earlier workers. Both temperature and duration of blanching affected the inactivation of the enzymes. There was no definite trend of change in enzyme activity with treatment after blanching. There was no clear-cut relation between degree of enzyme inactivation and loss of ascorbic acid.—W. Godden.

1886

DAMANSKI, A. F., NIKOLAEFF-MARIC, T. K. and BAKARIC, M. E. Rapport entre vitamine C et cellulose dans l'épinard et dans les pommes de terre. [Relation between vitamin C and cellulose in spinach and potatoes.] *Bull. Soc. Chim. biol.*, 1953, **35**, 981-983.

1887

ZOTOVA, O. N. Vliyanie nekotorykh uslovii vyrashchivaniya kartofelya na sodержание vitamina C. [The effect of certain conditions of cultivation on the vitamin C content of potatoes.] *Biokhimiya*, 1953, **18**, 205-209. [Kaf. Khran., Omsk. Sel'skhoz. Inst. Im. S.M. Kirova.]

Experiments on potato cultivation near Omsk, Siberia, showed that the nature of the soil, soil moisture, conditions of growth and variety all affected the vitamin C content. The value was higher in potatoes grown on light clay than on heavy clay. Spraying reduced the vitamin C content only slightly whether the season was wet or dry. Early varieties had a greater vitamin C content than others. The vitamin C content of Siberian varieties was intermediate between that of far-northern and far-eastern varieties and that of central and south-western varieties.

W. Hughes.

1888

KOTT, V. Dynamika obsahu l-askorbové kyseliny v ovoci za vegetace. [The dynamics of the L-ascorbic acid content of fruits in the course of vegetation.] *Sborn. čsl. Akad. Zěměd.*, 1953, **26**, 427-446. [Výzkumný Ústav Potravinářské Tech., Prague.] Russian and English summaries.

Ascorbic acid was estimated in 6 varieties of cherries, 1 of apples and 2 of pears at different stages of maturity. The content in the fruits was always highest at the early stages of development when the seeds or kernels were soft or undeveloped. It then fell rapidly and rose slightly again until the fruit attained physiological maturity. The biggest difference in ascorbic acid content between peel and pulp was in the early stages of development in apples, but in pears it was in the last stages of ripening. (From summary.)

W. Godden.

See also Absts. 1723, 1815, 2420, 2678.

OTHER VITAMINS

- 1889
REUSZ, A. Über Veränderungen des ultravioletten Absorptionsspektrums von Rutinlösungen durch Sterilisation. (Vorläufige Mitteilung.) [Changes in the ultraviolet absorption spectrum of rutin solutions caused by sterilisation. Preliminary communication.] *Klin. Wochenschr.*, 1953, **31**, 709-710. [Frauenklin., Univ. Erlangen.]

- 1890
GLEICHWEIT, E. Der Einfluss des Wirkstoff-Komplexes T auf Wachstum und Entwicklung des Goldhamsters (*Cricetus* [*Mesocricetus*] *auratus* Waterhouse). [Action of the factor T complex on the growth and development of the golden hamster.] *Ztschr. Vitamin-, Hormon-*

Fermentforsch., 1952-53, **5**, 249-264. [Zool. Inst., Univ. Graz.] French and English summaries.

The descendants of a single pair of golden hamsters were maintained on a diet of grains, black or white bread dried, green food and skimmed milk. Factor T was given in milk or directly into the mouth with a pipette [no dose mentioned]. It was given to the mother during gestation or lactation or to the young from the moment they could eat. In all, 72 litters including 435 individuals were used. Young hamsters receiving factor T in the different ways showed a very small superiority in growth over young animals not given factor T. When the mother was given vitamin E as well as factor T from mating, the superiority in growth was a little greater.—E. M. Hume.

4. PHYSIOLOGY OF NUTRITION

ENZYMES

- 1891
KUNG, J. T., HANRAHAN, V. M. and CALDWELL, M. L. A comparison of the action of several alpha amylases upon a linear fraction from corn starch. *J. Amer. Chem. Soc.*, 1953, **75**, 5548-5554. [Dept. Chem., Columbia Univ., New York.]

The linear fraction from maize starch was prepared by the method of Lansky *et al.* (*J. Amer. Chem. Soc.*, 1949, **71**, 4066) and the activities of 10 amylases were tested by their blue values with starch and estimation of their reducing powers.

Human pancreatic and salivary enzymes from the same or different persons had the same activity, and rat amylases from pancreas, liver, spleen and blood serum had activities similar to each other and to those of the human enzymes. Amylases from pig pancreas and pig saliva differed in activity from one another and from human and rat preparations. Taka amylase and amylase from *Bacterium subtilis* differed from each other and from the others.

The differences occurred in the early stages of hydrolysis when less than 25 per cent. of the glucosidic linkages of the substrate had been broken.—D. Harvey.

- 1892
MARSELLI, G. and COMUZZI, U. Attività arginasi del fegato e urea ematica in corso di digiuno. [Arginase activity of the liver and blood urea during fasting.] *Arch. Fisiol.*, 1952-53, **52**, 374-383. [Ist. Patol. Gen., Univ. Florence.] Experiments with guineapigs.

- 1893
GOMORI, G. and CHESICK, R. D. Esterases and phosphatases of the brain. A histochemical study. *J. Neuropathol. Exp. Neurol.*, 1953, **12**, 387-396. [Dept. Med., Univ. Chicago, Ill.]

- 1894
GOMORI, G. Human esterases. *J. Lab. Clin. Med.*, 1953, **42**, 445-453. [Dept. Med., Univ. Chicago, Ill.]

- 1895
HINES, B. E. and McCANCE, R. A. Pseudo-cholinesterase activity in secretions and organs of piglets and pigs. *J. Physiol.*, 1953, **122**, 188-192. [Med. Res. Council, Dept. Exp. Med., Univ. Cambridge.]

The cholinesterase activity of the serum, parotid and submaxillary glands and liver of adult pigs was 2 to 4 times as high as in piglets under 3 days of age. This agrees with the report of a histologist on the relative activity of parotid glands from adult and newborn pigs. The results differ from those previously recorded for dogs (Abst. 3047, Vol. 23). Figures are given for the cholinesterase activity of sow's colostrum and milk and of mixed salivary secretions of the pig.—W. Godden.

- 1896
TOTTER, J. R., BURNETT, W. T. (Jr.), MONROE, R. A., WHITNEY, I. B. and COMAR, C. L. Evidence that molybdenum is a nondialyzable component of xanthine oxidase. *Science*, 1953, **118**, 555. [Biol. Div., Oak Ridge Nat. Lab., Tenn.]

Labelled sodium molybdate was injected intravenously into a cow, and xanthine oxidase was isolated by Ball's method (Abst. 1572, Vol. 9) from milk collected one to several days thereafter. The preparation was treated twice with 25 to 40 per cent. ammonium sulphate, after which dialysis for 20 or 40 hr. had no effect on the ratio of ^{99}Mo to xanthine oxidase activity. Spectrophotometric data suggest a molar ratio of flavin to Mo of 2:1. The results were not affected by mixing radioactive with inactive milk before isolation of the xanthine oxidase.—W. Godden.

1897

LYNEN, F. and OCHOA, S. **Enzymes of fatty acid metabolism.** *Biochim. biophys. Acta*, 1953, **12**, 299–314. [Biochem. Abt., Chem. Lab., Univ. Munich.] French and German summaries.

A review.

1898

LYNEN, F. **Functional group of coenzyme A and its metabolic relations, especially in the fatty acid cycle.**

STADTMAN, E. R. **Discussion.** *Federation Proc.*, 1953, **12**, 683–691; 692–693. [Chem. Lab., Univ. Munich.]

1899

NOVELLI, G. D. **Enzymatic synthesis and structure of CoA.**

BEINERT, H. **Discussion.** *Federation Proc.*, 1953, **12**, 675–681; 681–682. [Biochem. Res. Lab., Massachusetts Gen. Hosp., Boston.]

1900

MAHLER, H. R. **Role of coenzyme A in fatty acid metabolism.**

JENCKS, W. P. **Discussion.** *Federation Proc.*, 1953, **12**, 694–702; 703. [Inst. Enzyme Res., Univ. Wisconsin, Madison.]

1901

JACOBSSON, K. P. and DEODATA DE AZEVEDO, M. Mode d'action des antibiotiques sur plusieurs enzymes animaux. [Mode of action of antibiotics on certain animal enzymes.] *Exp. Med. Surg.*, 1953, **11**, 149–156. [Inst. Rocha Cabral, Lisbon.] German and English summaries.

The effects were studied of adding aureomycin, terramycin or erythromycin to preparations of cholinesterase from human blood, to fumarase from beef liver, to thiaminase from shrimps, or to lipase from rabbit blood. No inhibition of the enzymes or of the alcoholic fermentation of yeast appeared to occur in the presence of the antibiotics tested, which in some cases appeared to increase enzyme activity.—A. M. Copping.

See also Absts. 1720, 1780, 1913.

DIGESTION AND ABSORPTION

1902

MACK, M. H., WOLF, S. and STERN, K. G. **Preliminary electrophoretic analysis of human gastric juice.** *J. Clin. Invest.*, 1953, **32**, 862–867. [New York Hosp.]

Although it is recognised that procedures used to prepare material for analysis may have altered the proteins, the electrophoretic analysis of concentrated gastric juice from normal subjects and those with gastric ulcer suggested the presence of at least 5 distinct proteins in varying concentrations. The identity of the fractions is discussed.

D. Duncan.

1903

HYMAN, S. and STEIGMANN, F. **The effect of pepper and depepperinized condiment upon gastric acidity in man.** *J. Lab. Clin. Med.*, 1953, **42**, 819–820. *Proc.* [Chicago, Ill.]

1904

MORRISON, S. and FELDMAN, M. **The constancy of acid values in a series of 227 peptic ulcer cases studied by repeated gastric analyses.** *Amer. J. Digest. Dis.*, 1953, **20**, 251–253. [11 E. Chase St., Baltimore, Md.]

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The numbers of patients tested twice, 3, 4, 5 and 6 times were, respectively, 143, 53, 24, 6 and 1. The interval between tests ranged from 1 day to 16 years. In 154 subjects acid values were constant over the observation period. Of the remainder, 48 varied upwards and 25 downwards.

F. C. Aitken.

1905

BOWIE, J. Y., DARLOW, G. and MURRAY, M. M. **The effect of sodium fluoride on gastric acid secretion.** *J. Physiol.*, 1953, **122**, 203–208. [Physiol. Lab., Bedford Coll., Univ. London, N.W.1.]

The effects of placing NaF in the stomach of anaesthetised cats were studied by measuring the response in acid secretion to injections of histamine. Inhibition was marked with concentrations of NaF above 0.005 M, and it is suggested that this may be due to an effect on the membrane of the oxyntic cells which results in an alteration of permeability to H ions.—D. Harvey.

1906

HELE, M. P. **The phosphorylation and absorption of sugars in the rat. 1. Hexokinase activity**

in the intestinal mucosa. 2. Sugar absorption *in vivo*, and its relationship to the phosphorylation of sugar *in vitro*. *Biochem. J.*, 1953, **55**, 857-863; 864-867. [Biochem. Lab., Univ. Cambridge.]

1. Adult rats were maintained on a diet containing rice starch 40, sucrose 17, light white casein 23, arachis oil 15, salt mixture 5, dried yeast 7.5 and cod liver oil 2.5 parts [given as percentages, but they add up to 110]. They were killed without being fasted. Homogenates were prepared from the whole small intestine.

The rate of hexokinase reaction at 0.005 *M* glucose or 0.028 *M* fructose increased with the adenosine triphosphate (ATP) concentration over the range 0.013 to 0.04 *M*, but with 0.0055 *M* fructose the rate was unaffected by ATP concentration. At constant ATP concentration the rate of hexokinase reaction dropped sharply with increase of glucose concentration from 0.0055 to 0.016 *M*, but then rose sharply to the original rate at 0.028 *M*. Reaction with fructose at constant ATP concentration increased steadily with increasing fructose concentration to a steady maximum at 0.022 *M* fructose. Mannose and xylose had effects similar to those of fructose, and galactose to those of glucose. The rate of phosphorylation of mixtures never equalled the sum of the components.

It is concluded that the differences in phosphorylation rates of glucose and fructose are due to a property of the hexokinase, and the possibility exists that there are two or more hexokinases in intestinal mucosa.

2. Sugar absorption from the small intestine was studied in anaesthetised rats after fasting for 48 hr. The absorption rate ratios of different sugars were similar to their phosphorylation rate ratios obtained as in the preceding paper. The total phosphorylating capacity of the intestinal mucosa was more than enough to account for phosphorylation of all the sugar absorbed during experiments *in vivo*.—D. Duncan.

1907

PONZ, F. Inhibición de la absorción selectiva de glucosa por el molibdato. [Inhibition of the selective absorption of glucose by molybdate.] *Rev. española Fisiol.*, 1953, **9**, 37-42. [Lab. Fisiol. Animal, Univ. Barcelona.] English summary.

Ammonium molybdate in concentrations from 0.005 *M* to 0.05 *M* was added to 5.4 per cent. glucose solutions to test the effect of molybdate on intestinal absorption of glucose in the rat. Successive absorption tests were made with each concentration on 5 animals, the first and third with glucose alone, the second and fourth with added molybdate. With 0.005 *M* molybdate there

was no effect on glucose absorption, but inhibition was evident with 0.025 *M* solutions. A concentration of 0.05 *M* caused inhibition by 20 to 50 per cent. in the first absorption test and 30 to 70 per cent. in the second. Washing the intestinal loop with saline after absorption of a glucose-molybdate solution did not restore normal absorption of glucose. In experiments made with 2 similar loops in one animal, absorption of 0.05 *M* molybdate from an isotonic NaCl solution in one loop did not inhibit glucose absorption in the adjoining loop. This indicated that the inhibiting effects of molybdate in the first tests were not caused by inhibition of the central mechanism, but were presumably due to a local effect of the molybdate on the epithelial cells.—M. B. Richards.

1908

LLUCH, M. and PONZ, F. Inhibición de la absorción intestinal de glucosa por el cerio. [Inhibition by cerium of absorption of glucose from the intestine.] *Rev. española Fisiol.*, 1953, **9**, 135-142. [Lab. Fisiol. Animal, Fac. Sci., Univ. Barcelona.] English summary.

1909

WILD, C., REYMOND, C. and VANNOTTI, A. Contribution à l'étude de la résorption des acides aminés. [Absorption of amino-acids.] *Schweiz. med. Wochenschr.*, 1953, **83**, 894-897. [Clin. Méd., Univ. Lausanne.]

The absorption of a balanced mixture of amino-acids was studied in subjects over 70 years of age and in a group of the middle-aged. In the old people the rise of amino-N in the blood was much less than in the middle-aged subjects. Increasing the amount of amino-acids given did not cause an equivalent increase of blood amino-N in either group. A greater increase of amino-N was observed in old subjects given an unbalanced mixture lacking tryptophan. Administration of B vitamins or of pancreatin before the amino-acid mixture improved its absorption in old subjects. Studies of N excretion, of blood sugar, lactic acid and pyruvic acid and of basal metabolism did not suggest increased utilisation of amino-acids in old age, but rather a slower process of absorption. Both absorption and utilisation were improved in the presence of B vitamins.—A. M. Copping.

1910

PFISTERER, H. Milch- und Zuckerempfindlichkeit nach Magenresektion. [Sensitivity to milk or sugar after resection of the stomach.] *Langenbecks Arch. klin. Chirurg.*, 1953, **275**, 528-543. [Chirurg. Klin., Univ. Cologne.]

In the author's view, nausea after milk or sugar is due not to failure to digest milk protein, to milk

allergy or to alimentary hypoglycaemia, but to a disturbance of absorption of sugar from the intestine, and the offending substance is the α -lactose in cow's milk.

During gastric resection for ulcer, glucose solution with barium was installed into the stomach remnant, closed duodenal stump or afferent jejunal loop (20 patients for each) and β -lactose solution into the 2 latter organs (10 patients for each) and the subsequent events were followed by X-rays and blood sugar estimations; blood sugar estimations were also made in 5 patients given no sugar, to rule out the effects of anaesthetic and operative trauma. Absorption of glucose was most rapid from the duodenum; blood sugar rose to a peak of 186 mg. per 100 ml. in about $\frac{1}{2}$ hr., then fell to nearly normal, with a second rise after about 2 hr. when the glucose had moved on to the jejunum. After instillation of glucose into the jejunum the early rise in blood sugar was even higher, but after 1 hr. it fell rapidly to about 80 mg. and there was no second rise. After instillation into the stomach remnant, blood sugar rose slowly to about 130 mg. after 4 hr. Absorption of β -lactose followed much the same course from both duodenum and jejunum; the peak value was reached after about 50 min. and the fall was less rapid than with glucose.

Similar differences in blood sugar curves were found when 40 patients 2 or 3 weeks after gastric resection were given 300 g. warm milk sweetened with 50 g. glucose and, a few days later, 300 g. of a dried milk preparation (Alete-Frühnahrung) with 25 g. β -lactose. Unpleasant symptoms occurred in 18 patients in the first test, but in only 2 in the second, though there was no significant difference in blood sugar curves.

These findings are taken to show that different sugars are acted on by specific enzymes located in different parts of the small intestine and to support Malyoth's hypothesis of the ready absorption of β -lactose.—W. M. Deans.

1911

STEINGRÄBER, M. and BURMEISTER, H. Untersuchungen über die Resorption von Eiweiss und Fett nach totaler Magenentfernung. [Absorption of protein and fat after total gastrectomy.] *Ztschr. ges. inn. Med.*, 1953, **8**, 737–741. [Chirurg. Klin. Charité, Univ. Berlin.]

The relative loss of fat and protein caused by rapid excretion was studied in normal subjects and in patients from whom part or all of the stomach had been removed, with anastomoses involving the oesophagus and duodenum or special loops of the intestine according to the technique of Tomoda or Graham. Total gastrectomy caused more serious loss of nutrients than partial resection, and the

extent of the loss depended on the type of anastomosis. The most effective techniques appeared to be those of Tomoda or Graham by which the passage of the partly digested food into the intestine was longer delayed. The percentage loss of energy in 2 such cases was 9.4 and 5.0, in comparison with 15.7, 25.6 and 35.8 in 3 other patients. In direct oesophago-jejuno-stomy and oesophago-duodenostomy great loss of fat occurred, which could be prevented to a considerable extent by satisfactory anastomoses.—A. M. Copping.

1912

BRAIN, R. H. F. Steatorrhoea in oesophago-gastric surgical practice. *Proc. Roy. Soc. Med.*, 1953, **46**, 438–444.

In continuation of previous work (Abst. 2756, Vol. 21), chronic malnutrition after subtotal gastrectomy in which the pyloric canal and pylorus were retained, or after oesophago-jejuno-stomy with the intact normal stomach left *in situ*, is discussed and representative cases are described. In all 4 patients fat balance tests showed only mild impairment of fat absorption, which could be overcome by frequent high-fat meals; the patients' loss of weight was ascribed to low food intake, due to the dumping syndrome or to oesophagitis from regurgitation of intestinal contents. On the other hand, a patient in whom the stomach was not removed and the lower oesophagus was replaced by an isolated portion of jejunum had a normal capacity for food and normal fat absorption and gained 13 lb. in the first year after operation.

W. M. Deans.

1913

MONTINI, T. and PONTREMOLI, S. Sui rapporti tra potere deidrogenante della bile e assorbimento enterico dei grassi. [Relation between the dehydrogenating activity of the bile and the intestinal absorption of fats.] *Arch. Fisiol.*, 1953, **53**, 84–93. [Ist. Fisiol., Univ. Genoa.] English summary.

Dogs with Thiry Vella loops in the intestine received 5 ml. of 20 per cent. emulsion of coconut oil, introduced into the loop with or without addition of ox bile heated at 100° C. for 30 min. or unheated. The mixture was withdrawn 30 min. later and the amount and iodine value of the fat were estimated. The dogs were then depancreatised and the experiment was repeated.

Before pancreatectomy the percentage of fat absorbed was 45 with no addition, 47 with heated ox bile and 60 with unheated ox bile. The corresponding values after pancreatectomy were 0, 19 and 35. The I value of the fat after withdrawal was always higher in the intact dogs, being highest with unheated ox bile. The I value also rose when coconut oil was incubated *in vitro* with ox bile, but not with heated ox bile. In further similar

tests *in vivo*, bile salts heated or unheated exercised a small effect in promoting absorption, but none in raising the I value. Bile of normal dogs behaved like ox bile, but bile from depancreatized dogs, whether it was heated or unheated, had no more action than heated bile from normal dogs.

It is, therefore, suggested that normal bile contains an enzyme which promotes the absorption of fat by dehydrogenating it, and that the enzyme is absent after pancreatectomy.

E. M. Hume.

1914

PETERSON, R. E. and ETINGER, R. H. **Radio-active iron absorption in siderosis (hemochromatosis) of the liver.** *Amer. J. Med.*, 1953, **15**, 518-524. [Dept. Biochem., Army Med. Serv. Grad. Sch., Walter Reed Army Med. Centre, Washington, D.C.]

Physiological amounts of ferric ^{59}Fe were given by mouth to 4 normal subjects and 2 patients with siderosis. In the normal subjects only from 1 to 4 per cent. of the Fe was absorbed, and the amount absorbed was almost identical with that detected in the red blood cells. Radio-active Fe was undetectable in the serum at 2 hr., the period of highest concentration in whole blood. In siderosis from 20 to 45 per cent. of the Fe given was absorbed. In one patient from whom stored Fe had been removed by repeated bleeding the amount of ^{59}Fe absorbed and the amount present in the red blood cells were identical, but increased absorption was indicated by the high serum Fe level at 2 hr., as well as by the balance technique. In a patient with hepatic siderosis the amount of ^{59}Fe absorbed was nearly 3 times as great as the amount found in the red blood cells. The use of red blood cell uptake of Fe as the sole index of absorption is therefore not reliable in patients with increased Fe storage. The very high rate of absorption in this patient was demonstrated also by a high ^{59}Fe level in the serum at 2 hr. It is suggested that after removal of stored Fe patients with haemochromatosis should be maintained in a state of slight hypochromic anaemia by frequent bleeding and phosphate administration.

M. B. Richards.

1915

SINGER, H., SPORN, J. and NECHELES, H. **Mann-Williamson ulcer: analysis of digestion and absorption.** *Amer. J. Physiol.*, 1953, **175**, 322-326. [Dept. Gastrointestinal Res., Med. Res. Inst., Michael Reese Hosp., Chicago, Ill.]

In one group the dogs were prepared by a typical Mann Williamson operation, and in the other by a modification of it in which the pyloric antrum and the duodenal loop opened proximally by a cannula and distally into the terminal ileum. The Mann Williamson dogs survived between 18

and 96 days and showed delayed and decreased digestion and absorption of gelatine, but all 3 dogs in the second group had unimpaired digestion and absorption of gelatine and were still in good health after 200 days. Absorption of glycine and sugar was normal in both groups. Absorption of particulate fat occurred in 7 out of 12 Mann Williamson dogs, despite the absence of bile.

The reduced absorbing surface and the altered protein digestion are thought to be significant in the production of Mann Williamson ulcers.

D. Duncan.

1916

MANUNTA, G. Progressione ed assorbimento degli alimenti nel ratto ipotiroideo per trattamento con metiltiouracile. [Movement and absorption of food by rats rendered hypothyroid by treatment with methylthiouracil.] *Arch. Fisiol.*, 1952-53, **52**, 368-373; *Boll. Soc. ital. Biol. sper.*, 1952, **28**, 1939-1941. [Ist. Fisiol. Animali Domest., Univ. Sassari.]

1917

COMLINE, R. S., POMEROY, R. W. and TITCHEN, D. A. **Histological changes in the intestine during colostrum absorption.** *J. Physiol.*, 1953, **122**, 6P. [Physiol. Lab., Univ. Cambridge.]

A study with kittens and pigs.

1918

ZUBRILIN, A. A., EVSEEV, P. E., DROZDENKO, N. P. and KUKOLEVA, A. I. [The physiological role of the rumen in the process of digesting the cellulose of coarse fodder.] *Sovet. Zootech.*, 1952, No. 12, 61.

1919

SIMONNET, H. and LE BARS, H. Relations entre la motricité du rumen et la glycémie chez le mouton. [Relation between rumen motility and blood sugar in the sheep.] *C.R. Acad. Sci.*, 1953, **237**, 751-753.

High or low blood sugar was induced in sheep by injection of glucose or insulin. Glucose at the rate of 2 g. per kg. bodyweight produced high blood sugar followed by a fall to below normal. The frequency and strength of rumen contractions were reduced when blood sugar was high, but the strength of contractions returned to normal during the phase of low blood sugar. This was followed by rumination characterised in the usual way by increase in both strength and frequency of contraction. The low blood sugar after insulin was accompanied by increased frequency and strength of contraction and rumination. It is considered that the movements of the rumen and other parts of the stomach are influenced by

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metabolic processes and that a humoral mechanism may exist.—A. T. Phillipson.

1920

PFANDER, W. H. and PHILLIPSON, A. T. **The rates of absorption of acetic, propionic and *n*-butyric acids.** *J. Physiol.*, 1953, **122**, 102–110. [Rowett Res. Inst., Bucksburn, Aberdeenshire.]

Sheep previously provided with rumen cannulae were starved for 18 hr., then the rumen was emptied and washed out. The sheep were anaesthetised and the rumen was isolated from the rest of the

digestive tract. Solutions containing acetic, propionic and butyric acids in Krebs bicarbonate saline were introduced and their concentrations were kept constant by introduction of more acids from a burette, which served as an index to the rate of absorption.

At pH 5.6 to 6.5 the rates of absorption, in descending order, were acetic, butyric and propionic. In 2 unanaesthetised feeding sheep the order was thought to be the same, but the rate of disappearance was slower. Metabolism of butyric acid is considered to be an important source of energy.—D. Duncan.

COMPOSITION OF BODY FLUIDS AND TISSUES

BLOOD

1921

ROCHE, J., DERRIEN, Y. and ROQUES, M. Sur le remplacement des hémoglobines de type adulte par celles de type foetal au cours du développement embryonnaire et après la naissance, chez l'homme et chez le boeuf. [Replacement of adult type haemoglobin by foetal type during embryonic development and after birth in man and cattle.] *Bull. Soc. Chim. biol.*, 1953, **35**, 933–943. [Lab. Biochim. Gén., Coll. de France.]

[The title is as shown above.]

The haemoglobins were prepared by the method of Drabkin (*J. Biol. Chem.*, 1946, **164**, 703). A series of curves illustrates the variations in solubility of total carboxyhaemoglobin as a function of the concentration in equimolar solution of mono- and di-potassium phosphates.

Two types of adult and 3 of foetal Hb are distinguished in man, and 3 and 4 types, respectively, in cattle. In adult men and cattle there was always a small proportion of alkali-resistant, or "foetal", Hb. The percentage of the foetal fraction in Hb from human foetuses was 95 at 4 to 5 months, and about 80 during the last 3 months of gestation. It fell to 70 at about 2 months after birth, to 23 at 3 months, and reached the adult level of 3 to 7 at between 6 and 12 months. The time required for the transition from the mixture present at birth to the adult mixture was not greatly different from the average life of a red cell, *i.e.*, 120 days. The change is considered to be associated with the state of development of blood-forming organs rather than with conditions of oxygenation. The plateau observed in man during the last 3 months of gestation and the first month of life, with about 80 per cent. foetal Hb, is replaced in cattle by a steady increase, but the adult level is reached in both species at about the same time.—D. Duncan.

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1922

DRESCHER, H. and KÜNZER, W. Die Hämoglobintypen des Neugeborenen. [The types of haemoglobin in the newborn infant.] *Arch. Gynäkol.*, 1953, **182**, 698–706. [Frauenklin., Univ. Würzburg.]

Denaturing experiments with alkali led to the conclusion that only 2 types of Hb, foetal and adult, are present in the blood of newborn infants. In 23 full-term infants, foetal Hb amounted on the average to 74.1 per cent. of the total Hb in cord blood and fell to 70.9 per cent. in capillary blood at 12 hr. after birth, and to 64.0 per cent. after 6 days. In 8 premature infants the proportion of foetal Hb fell from 80.7 per cent. in cord blood to 73.8 per cent. in capillary blood after 8 days.

M. B. Richards.

1923

BANERJEE, B. Haematological standards of students and nurses of the Assam Medical College, Dibrugarh. *Indian J. Physiol. Allied Sci.*, 1953, **7**, 175–181. [Dept. Physiol., Assam Med. Coll., Dibrugarh.]

The data were obtained from 73 men and 12 women students and 38 nurses. The mean values and standard deviations for these groups were: red cell count 5.2 ± 0.9 , 4.2 ± 0.48 and 4.08 ± 0.48 millions per c.mm.; Hb 14.76 ± 1.12 , 12.65 ± 0.78 and 12.1 ± 1.5 g. per 100 ml.; cell volume 44.2 ± 4.4 , 39.5 ± 2.2 and 39.1 ± 4.0 per cent. The data for mean cell volume and Hb content and for sedimentation rates also are tabulated. (See Abst. 4922, Vol. 23).—D. Harvey.

1924

ELLIS, B. C. Plasma and total blood volume estimations by the T1824-haematocrit method. The normal values on the Witwatersrand-altitude 5,740 feet. *S. African J. Med. Sci.*, 1953, **18**, 45–56. [Dept. Clin. Pathol., Univ. Witwatersrand, Johannesburg.]

Techniques and results are given for measurements made on 20 healthy South African white males between 20 and 48 years of age. Ranges and mean values for the data, with standard deviations for the blood, are: height, 160 to 185, 176 cm.; weight 61.4 to 86.9, 71.5 kg.; plasma volume, 2240 to 3360, 2800 ± 265.3 ml.; total blood volume, 4180 to 6270, 5370 ± 588.0 ml.; red cell volume 1940 to 3150, 2570 ± 360.8 ml.; venous packed cell volume 44.1 to 52.9, 49.7 ± 2.25 per cent. Comparison is made with data from 6 sources at sea level and 2 at 800 ft. on the basis of volumes per unit bodyweight; the Johannesburg values show reductions of 13 and 8 per cent., respectively, for plasma and total volume and no significant difference for red cell volume.

The evidence for the existence of mild polycythaemia is briefly reviewed and it is suggested that 2 mechanisms may exist, by the first of which adaptation to reduced barometric pressure is brought about by a decrease in plasma volume. At higher altitudes the second, an increase in the volume of circulating red cells, begins to operate.

D. Harvey.

1925

KARVONEN, M. J. and KUNNAS, M. **Factor analysis of haematological changes in heavy manual work.** *Acta physiol. scand.*, 1953, **29**, 220-231. [Inst. Occupational Health, Helsinki.]

The results analysed are those described in Abstr. 1782, Vol. 23, and in Karvonen (Ed.), *Sports Medicine*, Helsinki, Suomen Urheilulääkäriyhdistys, 1953. Factorial analysis of the changes in the different types of blood cell as a result of work in the Finnish National Lumber Competition suggested that the fall of red cells, eosinophils and lymphocytes and the increase in neutrophils were due to adrenal cortical stimulation. A second factor of unknown physiological significance showed high loadings for neutrophil youth forms and low for mature forms.—D. Duncan.

1926

LINDHOLM, A. **Blood volume and total amount of haemoglobin in "heatworkers".** *Arbeitsphysiologie*, 1953, **15** 99-102. [Dept. Physiol., Central Gymnastic Inst., Stockholm.]

No statistically significant difference in total Hb or blood volume per kg. bodyweight was found between 3 groups of workers in steel mills: those exposed to heat of the furnaces or the glowing steel nearly all day; those working at the open-hearth furnaces where the direct exposure was not longer than 1 to 2 hr., the rest of the time being spent in other and cooler places; and men working outdoors or at places not exposed to heat.

W. Godden.

1927

GEDDA, E. Normalvärden för hämoglobin enligt gravimetrisk metod hos skolorbarn i Göteborg (folkskolematerial). [Normal values for haemoglobin by the gravimetric method, in schoolchildren in Gothenburg (primary schools).] *Nord. Med.*, 1953, **50**, 1394-1395. [Gothenburg.] English summary.

1928

CASSELLS, D. E. and MORSE, M. **Arterial blood gases and acid-base balance in normal children.** *J. Clin. Invest.*, 1953, **32**, 824-836. [Dept. Paediat., Clin. Univ. Chicago, Ill.]

This study, of 41 children up to 10 years of age and of 63 boys between 11 and 17 years old, was undertaken to define the range of values in healthy children.

Hb value increased with age from 12.3 g. per 100 ml. at 2 years to 14.7 g. at 15 to 17 years. Mean percentage arterial oxygen saturation was 94.2 at 2 to 4 years, but had reached the adult level of 95.8 in children of 7 to 17 years. The CO_2 content of arterial blood increased with age from a mean of 40.1 vol. per cent. at 2 to 3 years to 44.4 vol. at 4 to 6 years and 48.5 vol. in the adult. The alkali reserve increased similarly. Arterial CO_2 tension rose at 13 years from 38 mm. Hg to the adult level of 41 mm. The acid-base balance showed some excess acid and CO_2 deficit in children below 12 years. The electrolyte balance showed a gradual rise in serum bicarbonate in adolescence, but no compensating change in other ions was detected.—M. S. Fraser.

1929

LINHARD, J., BUSSON, F., TRAPET, P., GIRAUD, P., LECOCQ, F. and GUYONNET, C. Variation de la protéinémie sérique relative chez l'Africain de Dakar au cours de l'année. [Variations in the serum protein concentration of Africans in Dakar in the course of the year.] *Méd. trop.*, 1953, **13**, 530-533. [Org. Enquête Étude Anthropol. Pop. Indigènes A.O.F. Aliment, Nutrit.]

Total serum protein was estimated monthly throughout the year in a large series of Africans and a small series of Europeans, all resident in Dakar. The mean values for Europeans were consistently lower than those for Africans, but in both the values showed a seasonal variation. At the beginning of the hot weather there was a sudden fall followed by a steady rise to a value which was above the initial and persisted during the remainder of the hot weather; a short rise occurred at the start of the cold weather, followed by a fall to the initial value.—L. Wills.

N.A. and R., April 1954

1930

WADSWORTH, G. R. and OLIVEIRO, C. J. **Plasma protein concentration of normal adults living in Singapore.** *Brit. Med. J.*, 1953, ii, 1138-1139. [Dept. Physiol., Univ. Malaya, Singapore.]

Plasma protein concentration was estimated by the copper sulphate specific gravity method and the accuracy of the method was tested against estimations of total N by the macro-Kjeldahl method.

Mean values for 80 men and 59 women were 7.8 g. and 7.6 g. per 100 ml., respectively. Differences between mean values for Asians and Europeans were not statistically significant.—F. C. Aitken.

1931

CLOSE, J. Étude électrophorétique des protéines sériques de cas de kwashiorkor. [**Electrophoretic study of the serum proteins in cases of kwashiorkor.**] *Ann. Soc. belg. Méd. trop.*, 1953, **33**, 185-202. [I.R.S.A.C., Centre du Kivu, Liwiro, Belgian Congo.] Flemish summary.

An electrophoretic study of serum proteins was made in 15 African infants with untreated kwashiorkor; the figures obtained were compared with those from normal African infants of the same age. The respective mean values in g. per 100 ml. were: albumin 1.1 and 3.07, α -globulin 1.1 and 0.48, β -globulin 0.4 and 0.13, γ -globulin 1.5 and 1.85. A curve from a single adult with the disease showed similar changes. The presence also of abnormal proteins was suggested by the shape of the curves. The changes in serum proteins were followed during treatment with a diet of enriched milk. There was an immediate rise in serum albumin, which had often returned to normal after 3 weeks' treatment, and at the same time there was a moderate increase in γ -globulin. The α - and β -globulins showed variable changes. One patient developed typhoid 5 weeks after the beginning of treatment; there was an immediate fall in the total protein due to a fall in both albumin and γ -globulin, followed as convalescence began by a rise in γ -globulin, though albumin continued to fall.—L. Wills.

1932

VITELLI, A., GRANDIS, C. and VITELLI PACCES, L. L'assorbimento del siero nell'ultravioletto per lo studio della composizione proteica e del contenuto in aminoacidi aromatici. 1. La curva di assorbimento dei sieri di soggetti normali. [**Absorption of ultraviolet light by serum for the study of its protein composition and content of aromatic amino-acids. 1. The absorption curve of serum from normal subjects.**] *Arch. Sci. biol., Bologna*, 1953, **37**, 332-339. [Clin. Med., Univ. Turin.]

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The ultraviolet absorption curves at pH 10 and pH 2 of sera from 14 healthy subjects aged from 25 to 35 years showed notable constancy in behaviour in both alkaline and acid solution. That this absorption depends entirely on the aromatic amino-acid content of the serum protein fractions has been confirmed by parallel estimation with tyrosine, tryptophan and phenylalanine. In NaOH the curve of the mixture of the 3 amino-acids is completely superposable on the theoretical curve obtained from the sum of the 3 separate absorptions and is the same as the curve of normal sera. In acid solution there are slight deviations from these results. The constancy of the absorption curves for normal sera will allow useful comparisons to be made with pathological sera and proteins of other organic fluids and may make it possible to estimate the 3 amino-acids responsible.—M. B. Richards.

1933

BLASS, J., ROUHI, A., LECOMTE, O. and MACHE-BOEUF, M. Recherches sur les constituants azotés des extraits lipidiques du sang (amino-acides, peptides, éthanolamine). [**The nitrogenous constituents of lipid extracts of blood (amino-acids, peptides, ethanolamine).**] *Bull. Soc. Chim. biol.*, 1953, **35**, 959-968. [Serv. Chim. Biol., Inst. Pasteur, Paris.]

The light petroleum extracts of human and horse plasma and red cells contain nitrogenous impurities and amino-acids as well as lipids. The amino-acids can be removed by dialysis or electro-dialysis, but this does not remove all nitrogenous matter, as is shown by chromatography. The purified lipids on hydrolysis liberate amino-acids which were bound probably as lipopeptides. Ethanolamine was found in small amounts in the lipids of blood plasma. The amino-acids found were in agreement with the findings of Wynn and Williams (Abst. 2029, Vol. 20).—W. Godden.

1934

HARDIN, R. C., JACKSON, R. L., COOK, J. E., JOHNSTON, T. L. ROUTH, J. I. and KELLY, H. G. Alterations in serum globulins, cholesterol and lipoproteins as related to diabetic retinitis. *J. Lab. Clin. Med.*, 1953, **42**, 812-813. *Proc.* [Iowa City, Iowa.]

1935

JENNINGS, F. W. and MULLIGAN, W. Levels of some chemical constituents in normal horse sera. *J. Comp. Pathol.*, 1953, **63**, 286-293. [Vet. Sch., Univ. Glasgow.]

Blood serum from 30 normal horses was analysed for total protein, albumin, globulin, Ca, Mg, inorganic P, alkaline phosphatase, bilirubin and urea. Albumin and globulin were estimated by paper

electrophoresis. It is suggested that this technique, unlike salting-out methods, should be suitable for the sera of all domestic animals.

In general, the results obtained were in good agreement with such other published figures as are available.—W. A. Greig.

1936

GROULADE, P. and GROULADE, J. Étude par micro-electrophorèse sur papier du sérum de chiens normaux et pathologiques. [Study of the serum of normal and diseased dogs by micro-electrophoresis on paper.] *Ann. Inst. Pasteur*, 1953, **85**, 508–511. [Centre Transfusion, Grenoble.]

1937

LYNCH, J. E. and STAFSETH, H. J. Electrophoretic studies on the serum proteins of turkeys. 1. The composition of normal turkey serum. *Poultry Sci.*, 1953, **32**, 1068–1073. [Dept. Bacteriol., Agric. Exp. Stat., Michigan State Coll., East Lansing.]

1938

SCHJEIDE, O. A. and DEUTSCH, L. Studies of the New Hampshire chicken embryo. 2. Ultra-centrifugal studies of the serum proteins. *J. Biol. Chem.*, 1953, **205**, 245–253. [Sch. Med., Univ. California, Los Angeles.]

1939

CLEGG, R. E. and HEIN, R. E. Lack of a correlation between variations in the amount of calcium and serum albumin in the blood sera of chicks. *Poultry Sci.*, 1953, **32**, 867–870. [Kansas State Coll., Manhattan.]

1940

GITLIN, D. and JANEWAY, C. A. The dynamic equilibrium between circulating and extra-vascular plasma proteins. *Science*, 1953, **118**, 301–302. [Dept. Paediat., Harvard Med. Sch., Boston, Mass.]

A 10 per cent. solution of protein prepared by fractionation and dialysis of pooled rabbit antisera against pneumococcus type III polysaccharide was injected intravenously into normal rabbits from which an equal volume, 15 to 20 ml., of blood had previously been removed. Subsequent exchange transfusion of normal rabbit blood, or injection of the specific antigen, was followed by the expected fall in circulating antibody, but the circulating antibody then rose rapidly before resuming the logarithmic decline found in rabbits injected with antisera but not otherwise treated. It was concluded that preformed plasma protein in the extra-vascular pool is in dynamic equilibrium with that in the circulation and can rapidly make good depletion of the latter.—W. M. Deans.

1941

MAURER, W. and MÜLLER, E. R. Untersuchung der Transportfunktion einzelner Serum-Eiweiss-Fractionen für Phosphatide nach einer neuen papierelektrophoretischen Methode. [Transport function of some serum protein fractions for phosphatides, studied by a new paper electrophoresis method.] *Biochem. Ztschr.*, 1953, **324**, 255–265. [Med. Klin., Univ. Cologne.]

1942

MORTENSEN, R. A. The effect of diet on the glutathione content of erythrocytes. *J. Biol. Chem.*, 1953, **204**, 239–243. [Dept. Biochem., Sch. Med., Coll. Med. Evangelists, Loma Linda, Calif.]

Weanling rats received diets deficient in methionine, with soya bean α -protein or extracted peanut meal as protein sources. Controls received Purina chow or the deficient diets with methionine supplement.

Reduced glutathione in the red blood cells was 59 mg. per 100 ml. in controls, but in methionine-deficient rats it rose in 2 weeks to 114 mg. per 100 ml. Liver glutathione was decreased to about a third of its normal value. Addition and withdrawal of methionine supplements produced rapid changes of glutathione level in the red cells. It is suggested that glutathione formed in the liver may be used to maintain red cell glutathione.

D. Duncan.

1943

GERTLER, M. M. and OFFENHEIMER, B. S. Serum uric acid levels in men and women past the age of 65 years. *J. Gerontol.*, 1953, **8**, 465–471. [Med. Div., Home Aged and Infirm Hebrews, New York.]

The subjects were 38 men aged from 66 to 86 and 91 women aged from 65 to 88 years who were free from diseases known to affect metabolism or retention of uric acid and for whom data are tabulated for uric acid, free and total cholesterol, lipid P, and S_r 10–20 molecules in serum and for ponderal index ($H/3\sqrt{W}$).

There was a sex difference in uric acid content, the mean for men, 4.96 mg., being significantly greater than for women, 4.55 mg. per cent., and nearly twice as many men as women had levels above 6.0 mg. For men correlations of uric acid with total cholesterol, with lipid P and with S_r 10–20 molecules were significant; that with ponderal index was not. For women the correlation of uric acid with ponderal index was alone significant.

Possible explanations of these sex differences are discussed.—D. Harvey.

1944

LINHARD, J., BUSSON, F., GIRAUD, P. and GUYONNET, C. Dosage du calcium sérique. Application à des sérums d'Africains de Dakar. [Estimation of serum calcium: application to the serum of Dakar Africans.] *Méd. trop.*, 1953, **13**, 520-525. [Org. Enquête Étude Anthropol. Pop. Indigènes A.O.F. Aliment. Nutrit.]

In 24 young adult Europeans living in Dakar the mean serum Ca was 9.883, range 9.1 to 10.8, mg. per 100 ml. In 256 apparently healthy male Africans of different races living in Dakar the mean was 9.236, S.D. 0.427, range 8.0 to 11.3. In a series of 37 African women from another place the mean was 9.067, S.D. 0.787, range 7.6 to 11.6. The distribution of values for the African males was normal. No difference between the values for different races of Africans was found. Spasmodophilia was fairly frequent among the Africans studied.—L. Wills.

1945

HOPKINS, T. R., CONNOR, T. B. and HOWARD, J. E. Ultrafiltration studies on calcium and phosphorus in pathological human serum. *Bull. Johns Hopkins Hosp.*, 1953, **93**, 249-268. [Dept. Med., Johns Hopkins Univ., Baltimore, Md.]

Ultrafiltration data, obtained by Laviertes's technique with rigid pH control, are presented for sera from normal subjects and from patients with disorders involving abnormal concentrations of serum Ca, P and protein. No correlation was found between high Ca and high protein values in the diseases studied. In general low protein was associated with low Ca. High ultrafiltrable Ca is considered to be of no differential diagnostic value in hyperparathyroidism, since it was found also with all high Ca values of non-parathyroid origin, and in hyperparathyroidism might not be found unless total serum Ca was also high. With a few exceptions the inorganic P of serum was almost all ultrafiltrable, and similarly, with a few exceptions, the ratio of ultrafiltrable Ca to total serum Ca was within the normal range. This ratio remained relatively constant despite marked changes in total serum Ca produced by therapeutic or surgical means.—M. B. Richards.

1946

LINHARD, J., BUSSON, F. and GIRAUD, P. Dosage du magnésium sérique. Application à des sérums d'Africains de Dakar. [Estimation of serum magnesium: application to the serum of Dakar Africans.] *Méd. trop.*, 1953, **13**, 526-529. [Org. Enquête Étude Anthropol. Pop. Indigènes A.O.F. Aliment. Nutrit.]

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Serum Mg was estimated colorimetrically with thiazole yellow in 95 healthy African and 10 European men living in Dakar. The mean serum Mg in Africans was 2.1, range 1.5 to 2.8 mg. per 100 ml.; in Europeans the mean value was 2.15. The distribution of the values in the African series was normal.—L. Wills.

1947

MARTIN, H. E., MEHL, J. and WERTMAN, M. Clinical studies of magnesium metabolism. *Med. Clins. N. Amer.*, 1952, **36**, 1157-1171. [Los Angeles County Hosp., Calif.]

In chronic renal disease serum Mg is generally positively correlated with serum K, though not with serum Na or Ca. In acute renal failure it is raised during oliguria, but falls rapidly during the period of diuresis. In untreated diabetic coma serum Mg is raised, but after treatment it falls rapidly during the marked diuresis; while Mg is high serum K may be low. In conditions such as epilepsy, eclampsia, hyperthyroidism and pancreatitis serum Mg is low, but the mechanism producing this change is not known. No definite sign or symptom could be related to low serum Mg; this is in contrast to the findings in animals, in which Mg deficiency produces neuromuscular changes.—L. Wills.

1948

HOWARD, R. B. Diurnal rhythm of the serum iron level: effect of diet and of environmental temperature. *J. Lab. Clin. Med.*, 1953, **42**, 817-818. *Proc.* [Minneapolis, Minn.]

1949

BRENDSTRUP, P. Influence of body temperature on serum iron concentration and total iron-binding capacity of serum. *Acta pathol. microbiol. scand.*, 1953, **33**, 129-132. [Dept. H. Rigshosp., Denmark.]

1950

HORST, W. and SCHÄFER, K. H. Die Eisenbindung im Serum und in weiteren biologischen Flüssigkeiten, untersucht mit Papierelektrophorese und Radioeisen (^{59}Fe und ^{55}Fe). Zugleich eine neue Methode zur Beurteilung der Eisenbindungskapazität biologischer Flüssigkeiten. [Iron binding in serum and other biological fluids, investigated by paper electrophoresis and radio-active iron (^{59}Fe and ^{55}Fe), with a new method for estimating the iron-binding capacity of biological fluids.] *Klin. Wochenschr.*, 1953, **31**, 791-797. [Strahleninst., Univ. Hamburg, Eppendorf.]

1951

MUKHERJEE, C. and MUKHERJEE, S. K. **Studies in iron metabolism in anaemias in pregnancy. 2. Iron binding capacity and iron saturation of plasma.** *J. Indian Med. Assoc.*, 1953, **23**, 1-10. [Eden Hosp. Women, Calcutta.]

For part 1, see Abst. 614, Vol. 24.

Tables of frequency distribution with mean values, S.D. and S.E. are presented for Fe-binding capacity and Fe saturation of plasma of 50 normal non-pregnant women, 60 healthy women in the last trimester of pregnancy, 78 patients with Fe-deficiency anaemia, 58 with dimorphic anaemia and 12 with nutritional macrocytic anaemia of pregnancy. Values obtained week by week from the third month of pregnancy in 10 healthy women are presented and the effect is shown of intravenous administration of 25 mg. Fe daily for 1 week to 28 women in the 38th to 39th week of normal gestation.

The increase in Fe-binding capacity and decrease in Fe saturation of plasma observed as pregnancy progresses normally were exaggerated in Fe-deficiency and dimorphic anaemias. In nutritional macrocytic anaemia Fe-binding capacity was somewhat less than and Fe saturation was about the same as in normal pregnancy. In normal pregnant women administration of Fe caused little change in total Fe-binding capacity and an increase in Fe saturation.—F. C. Aitken.

See also Absts. 1572, 1575, 2266, 2414.

LYMPH, CEREBROSPINAL FLUID, ETC.

1952

BORGSTRÖM, B. and LAURELL, C. B. **Studies on lymph and lymph-protein during absorption of fat and saline by rats.** *Acta physiol. scand.*, 1953, **29**, 264-280. [Dept. Physiol., Univ. Lund.]

Cannulae were inserted into the main lymph vessel draining the small intestine of rats. The animals were then starved for 18 hr. before the administration by mouth of 1.0 ml. maize oil, 10 ml. 0.9 per cent. NaCl or 10 ml. 5.5 per cent. glucose. Lymph was collected for estimation of protein and electrophoretic examination.

The results suggest that lymph flow depends partly on the volume of blood flowing through the small intestine. The flow increased considerably after the administration of maize oil and to a smaller extent after saline or glucose.

Electrophoresis showed that the protein pattern of the lymph was identical with that of plasma and independent of the variations in the protein concentration of the lymph. Fat particles migrated with the same velocity as albumins. Lipoproteins of the type found in plasma did not increase in the lymph during maize oil absorption.

G. A. Garton.

1953

BAUDOUIN, A., LEWIN, J. and HILLION, P. **Électrophorèse sur papier des protéines du liquide céphalorachidien. Étude des lipoproteins. [Paper electrophoresis of proteins of cerebrospinal fluid. Study of lipoproteins.]** *C.R. Soc. Biol.*, 1953, **147**, 1036-1040.

1954

LUDEWIG, S. **Glutamine, glutamic acid, and γ -aminobutyric acid in cerebrospinal fluids.** *Arch. Neurol. Psychiat., Chicago*, 1953, **70**, 268-270. [Dept. Biochem., Dept. Med., Univ. Virginia, Charlottesville.]

Glutamine in cerebrospinal fluid from 26 patients with neurological disorders ranged from 5.4 to 9.4 mg. per 100 ml. with a mean of 7.35 ± 2.0 . Thirteen of the samples were analysed for glutamic acid, but it was either absent or present only in traces. γ -Aminobutyric acid could not be detected in any of the fluids investigated. No relation could be established between glutamine content and the type of disorder.—W. Godden.

1955

BLACKWELL, R. Q. and FOSDICK, L. S. **The amino acid content of human salivary mucin.** *J. Dent. Res.*, 1953, **32**, 639. *Proc.* [Northwestern Univ. Sch. Dent., Chicago, Ill.]

1956

WHEATLEY, V. R. **Studies of sebum. 4. The estimation of squalene in sebum and sebum-like materials.** *Biochem. J.*, 1953, **55**, 637-640. [Dept. Biochem., St. Bartholomew's Hosp. Med. Coll., London, E.C.1.]

See Absts. 1352, 1809, Vol. 23.

1957

BROUWER, E. and NIJKAMP, H. J. **Occurrence of two valeric acids (β -methylbutyric acid and α -methylbutyric acid) in the hair grease of the dog.** *Biochem. J.*, 1953, **55**, 444-447. [Lab. Animal Physiol., Agric. Univ. Coll., Wageningen, Netherlands.]

1958

SWINGLE, K. F. **The chemical composition of urinary calculi from range steers.** *Amer. J. Vet. Res.*, 1953, **14**, 493-498. [Montana Vet. Res. Lab., Agric. Exp. Stat., Bozeman.]

Urinary calculi from 63 steers were qualitatively examined. All contained protein and silica, and frequently Ca and oxalate were present. Mg appeared less frequently and NH_4 , CO_3 and PO_4 ions were rarely found.

It is considered that the calculi may be formed by precipitation of the dissolved silica in the urine (50 to 150 p.p.m.) by mucoproteins. The

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conditions governing the form of the precipitation are not known.—P. C. Jowsey.

TISSUES

1959

HAMWI, G. J. and URBACH, S. **Body compartments : their measurement and application to clinical medicine.** *Metabolism*, 1953, **2**, 391–403. [Dept. Med., Div. Endocrinol. Metabol., Coll. Med., Ohio State Univ.]

The methods of investigation are reviewed. Estimates of total and extracellular water were made by antipyrine and thiocyanate methods and lean body mass was calculated from the formula of Pace *et al.* (Abst. 1477, Vol. 15). Mineral matter was taken to be 7 per cent. of lean body mass, and cell solids as the difference between total weight and the sum of fat, water and mineral matter.

Data are tabulated for 5 normal subjects between 36 and 53 years of age, 13 elderly, from 57 to 80 years, 5 each of emaciated, obese and diabetic patients and 2 other patients who had undergone testosterone therapy. Total body water in litres and cell mass in kg. for all subjects showed high degrees of correlation with surface area, $r = +0.89$ and $+0.81$, respectively. The changes which took place after testosterone therapy, increases in total body water and cell mass, were not associated with proportionate increases in weight and surface area. This finding is considered to indicate the value of the technique in the study of metabolic phenomena.—D. Harvey.

1960

BEST, W. R., KUHLE, W. J. (Jr.) and CONSOLAZIO, C. F. **Relation of creatinine coefficient to leanness-fatness in man.** *J. Lab. Clin. Med.*, 1953, **42**, 784–785. *Proc.* [Chicago, Ill.]

1961

FIDANZA, F., KEYS, A. and ANDERSON, J. T. **Density of body fat in man and other mammals.** *J. Appl. Physiol.*, 1953, **6**, 252–256. [Lab. Physiol. Hyg., Univ. Minnesota, Minneapolis.]

Samples of human subcutaneous and internal body fat were obtained from 5 adults during surgical operations. The differences between individuals and between locations were trivial. The mean density at 37° C. from 20 measurements was 0.9 g. per c.cm., S.D. $\pm 6.8 \times 10^{-4}$, S.E. of mean $\pm 1.5 \times 10^{-4}$. The mean modulus of expansion from 15° to 37° C. was 9.2×10^{-4} $\pm 1.3 \times 10^{-4}$. Fat samples from 7 mammalian species were also studied. In 3 dogs the fat did not differ greatly from the human samples. In man, dog, rabbit, rat and guinea-pig subcutaneous and internal samples were similar in composition, but in the steer, the pig and especially

in the lamb subcutaneous fat was less dense than internal. Butterfat had a density similar to that of internal fat from steers.

Sources of error in estimations of total body fat are discussed.—D. Duncan.

1962

REH, H. Die Fettzellgrösse beim Menschen und ihre Abhängigkeit vom Ernährungszustand. [The size of the fat cell in man and its relation to nutritional state.] *Virchows Arch.*, 1953, **324**, 234–242. [Inst. Pathol., Univ. Marburg a.d. Lahn.]

The size of fat cells in 16 subjects could be related to the nutritional state. The average diameter of cells from normal subjects ranged from 70 to 120 μ . Diameters below 70 μ were found in emaciation and above 120 μ in obesity and in patients with lipomas, the largest found being 170 μ . With enlargement in size the fat cells from different sites, and even from the same site, tended to be more variable in diameter.

M. B. Richards.

1963

KUZNETSOV, P. M. Khimiya zhirov ezha (Erinaceus rumanicus). [The chemistry of the fats of the hedgehog (*Erinaceus rumanicus*).] *Biokhimiya*, 1953, **18**, 163–168. [Nauch-Issled. Inst. Khim., Mosk. Gosud. Univ.]

Subcutaneous and body fats from 5 captive hedgehogs (*Erinaceus rumanicus*) and 2 caught wild were analysed. The iodine numbers of the subcutaneous fat were lower than those of the body fat. Of the total mixed subcutaneous fat about 21 to 23 per cent. was solid; stearic acid formed 20 to 22 per cent. of this fraction and palmitic acid the rest. The remaining 78 per cent. of the subcutaneous fat was oleic acid. The fats were triglycerides. Of the 0.35 per cent. of unsaponifiable material 19.8 per cent. was cholesterol.

W. Hughes.

1964

SULLIVAN, H. R. **The composition and structure of human dental enamel.** *Dent. J. Austral.*, 1953, **25**, 83–95. [Inst. Dent. Res., United Dent. Hosp., Sydney.]

A review with 145 references.

1965

BATTISTONE, G. C. and BURNETT, G. W. **The amino acid content of human dentin.** *J. Dent. Res.*, 1953, **32**, 635–636. *Proc.* [Dept. Dent. Res., Army Med. Serv. Grad. Sch., Washington, D.C.]

1966

PIEZ, K. A. **The amino acid content of dentin protein.** *J. Dent. Res.*, 1953, **32**, 706. *Proc.* [Nat. Inst. Dent. Res., Bethesda, Md.]

1967

- SIMMONDS, D. H. **Leucine-isoleucine content of wool.** *Nature*, 1953, **172**, 677-678. [Biochem. Unit, Wool Textile Res. Lab., C.S.I.R.O., Melbourne.]

Leucine and isoleucine were estimated by the method of Moore and Stein (Abst. 4469, Vol. 21) in protein hydrolysates of 64's quality Merino wool. Eight replicate analyses gave the following means and standard errors: leucine 4.90 ± 0.12 , isoleucine 1.97 ± 0.05 , total leucine isomers 6.87 ± 0.17 per cent.—P. C. Jowsey.

1968

- RYS, R. Zawartość cystyny w wełnach z owiec hodowanych na obszarze Polski. [The cystine content of wool of sheep bred in Poland.] *Rocz. Nauk rol. [B]*, 1953, **66**, No. 2, 129-131. [Pracownia Biochem., Central. Lab., Cracow.]

1969

- CHRISTENSEN, H. N. and RIGGS, T. R. **Amino acids and peptides in the oviduct of the laying hen.** *Proc. Soc. Exp. Biol. Med.*, 1953, **83**, 697-698. [Dept. Biochem. Nutrit., Tufts Coll. Med. Sch., Boston, Mass.]

Free and bound glycine and free, bound and non-glutathione bound α -amino-acids were estimated in hen oviducts, fresh or minced and incubated for 2 to 4 hr. at 37° C.

Both fresh and incubated oviducts were rich in free amino-acids; the bound, dialysable amino-acids extracted by picric acid were mostly glutathione or similar glycine-rich substances.

P. C. Jowsey.

1970

- HART, P. C. Onderzoek naar het mangaan-gehalte van runderlevers. [**Manganese content of livers of cows.**] *Tijdschr. Diergeneesk.*, 1953, **78**, 929-940. [Inst. Veeteeltk. Onderzoek T.N.O., Utrecht.] English, French and German summaries.

The material analysed was dried liver from 62 cows from an experiment in which half were given methylthiouracil (Vevoron) for 5 weeks during which they were fattened. Mn was estimated as KMnO_4 after acid digestion. Dry liver from control cows contained $10.90 \mu\text{g.}$ per g. and that from cows treated with methylthiouracil $8.44 \mu\text{g.}$ The weight of the liver after methylthiouracil was greater than in control cows, but the total Mn was less. Both differences were significant.

I. Leitch.

See also Abst. 2069.

DUCTLESS GLANDS AND HORMONES

1971

- SCOTT, J. L. (Jr.) and ENGEL, F. L. **The influence of the adrenal cortex and cold stress on fasting ketosis in the rat.** *Endocrinology*, 1953, **53**, 410-422. [Dept. Med., Duke Univ., Durham, N.C.]

See also Absts. 1754, 1804, 1874.

1972

- LUSTED, L. B., PICKERING, D. E., FISHER, D. and SMYTH, F. S. **Growth and metabolism in normal and thyroid-ablated infant rhesus monkeys (*Macaca mulatta*). 5. Roentgenographic features of skeletal development in normal and thyroid-ablated infant rhesus monkeys (*Macaca mulatta*).** *Amer. J. Dis. Child.*, 1953, **86**, 426-435. [Dept. Radiol., Univ. California Sch. Med., San Francisco.]

For previous papers see Abst. 643, Vol. 24.

Six monkeys were selected for X-ray study, 4 of them receiving thyroid-ablating doses of ^{131}I , at 22, 35, 122 and 162 days of age, respectively. Three eventually were treated with L-thyroxine at 6 or $20 \mu\text{g.}$ per kg. bodyweight daily. X-ray photographs of the whole body were taken every 30 days.

Within 30 days of thyroid ablation the rate of linear bone growth decreased, in conformity with

the cessation of body growth described in an earlier paper. Bone density increased. The animals which received $20 \mu\text{g.}$ L-thyroxine per kg. bodyweight daily showed resumption of normal bone growth within 30 days, but the one receiving only $6 \mu\text{g.}$ per kg. daily showed a poor response. Epiphyseal centres of maturation appeared late and developed slowly in athyroid monkeys. In the skull there was poor growth, relative and absolute enlargement of the *sella turcica*, delayed closure of sutures, marked overriding of parietal by occipital bones and delayed eruption of deciduous teeth. All the effects responded to treatment with L-thyroxine.—D. Benzie.

1973

- GRAD, B. **Changes in oxygen consumption and heart rate of rats during growth and ageing: role of the thyroid gland.** *Amer. J. Physiol.*, 1953, **174**, 481-486. [Gerontol. Unit, Allan Mem. Inst., Montreal.]

Oxygen consumption and heart rate were studied in rats continuously from birth to old age as described in Abst. 141, Vol. 22. The lowest values occurred at birth, the highest a month later, after which they declined gradually as the rats aged. This fall towards the end of life was due, at least partly, to diminished ability to react

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to thyroid hormone. After thyroid removal rats did not show the decline in heart rate and oxygen consumption with ageing, because of the great fall in the rate of both functions immediately after the operation. Male rats had a higher oxygen consumption than female if calculated per unit of metabolic size, *i.e.*, per kg.^{0.75} bodyweight, but there was no significant difference when calculated per unit bodyweight. Males had a higher heart rate calculated on equivalent bodyweights, but without this adjustment there was no difference between the sexes.—B. W. Simpson.

1974

PICHOTKA, J., KÜGELGEN, B. v. and DAMANN, R. Die Bedeutung der Schilddrüse für die Temperaturregulation. [**Importance of the thyroid for temperature regulation.**] *Arch. exp. Pathol. Pharmacol.*, 1953, **220**, 398–413. [*Physiol. Inst., Freiburg i. Br.*]

Deprivation of thyroid function, either by thyroidectomy or treatment with thiouracil, interferes seriously with temperature regulation in the guineapig. This was demonstrated by measuring the rate of decrease in rectal temperature when the animals were placed in a cold chamber at -1.5°C . For normal animals the temperature curves showed a steep initial fall, followed by a more or less prolonged flattening between 37° and 33° and a steeper fall below 33°C . In animals deprived of thyroid function the curves showed a continuous steep fall, with none of the flattening between 37° and 33°C . which is an expression of temperature-regulating efficiency. In animals treated with propylthiouracil for 15, 20 or 28 days the temperature curves during the cooling process showed increasing deviations from the normal with increasing length of medication. After 28 days' treatment the steepness and uniformity of the fall were even more pronounced than after thyroidectomy. The average times taken to reach a body temperature of 30°C . for 10 normal, 5 thyroidectomised, and 12 thiouracil-treated animals were 122, 49 and 39 min., respectively. During the cooling process oxygen intake in a normal animal increased from 6 to 20 ml. per min., in an animal treated with thiouracil for 3 weeks from 6 to 9 ml., and in a thyroidectomised animal from 4 to 6 ml. Thus the amount of energy which thyroid-deprived animals can produce to prevent the disturbance of temperature is only a fraction of the normal.—M. B. Richards.

1975

WASE, A. W., EICHEL, H. J. and REPPLINGER, E. **Relation of thyroid status to nitrogen excretion following exposure to thermal radiation.** *Proc. Soc. Exp. Biol. Med.*, 1953, **84**, 152–154. [*Div. Vol. 24, No. 2*]

Biol. Chem., Hahnemann Med. Coll., Philadelphia, Pa.]

Groups of 12 adult male rats were fed on a ration containing 18 per cent. protein. One group received 0.5 per cent. dried thyroid, another group 0.5 per cent. thiouracil. The third group served as controls. The status of the thyroid glands was confirmed by measuring the uptake of ¹³¹I before and after exposure to radiant heat. The rats were pair-fed and 3-day N balances started on the 21st and 28th days of experiment. All groups were in similar states of negative N balance. On the 34th day half the rats in each group were subjected to burning and a third N balance was begun.

The hyperthyroid burned rats excreted 50 per cent. more urinary N and 19 per cent. more total N than the hyperthyroid unburned rats. The control, euthyroid burned rats excreted 131 per cent. more urinary N than the unburned controls and 47 per cent. more total N, and their negative N balance increased by 57 per cent. In the hypothyroid group there was little change in the condition after burning.

It is suggested that the probability of other endocrine functions being involved in the initiation or perpetuation of abnormal protein catabolism after severe burns cannot be ruled out.

B. W. Simpson.

1976

LONG, J. F., HIBBS, J. W. and GILMORE, L. O. **The effect of thyroprotein feeding on the blood level of inorganic iodine, protein-bound iodine and cholesterol in dairy cows.** *J. Dairy Sci.*, 1953, **36**, 1049–1057. [*Dept. Dairy Sci., Ohio Agric. Exp. Stat., Columbus.*]

Dairy cows received thyroprotein at rates of 10, 15, 20 and 25 g. per 1000 lb. bodyweight daily. Changes in serum protein-bound iodine and plasma cholesterol were followed during and after treatment. Inorganic I and blood sugar were also estimated.

During treatment protein-bound I rose to a level above that expected from the clinical evidence of hyperthyroidism. Plasma cholesterol decreased for a time during treatment and then returned to normal. It rose above normal after the end of thyroprotein feeding and then gradually returned to normal. Inorganic I also increased during treatment. Blood sugar was unchanged. Neither plasma cholesterol nor protein-bound I could be closely correlated with the dosage of thyroprotein, though it was concluded that protein-bound I does reflect thyroid status.—J. N. Aitken.

1977

MELLEN, W. J. and HILL, F. W. **Effects of thiouracil, thyroprotein, and estrogen upon the basal metabolism and thyroid size of growing**

chickens. *Poultry Sci.*, 1953, **32**, 994-1001. [Dept. Poultry Husb., Cornell Univ., Ithaca, N.Y.]

Groups of 20 male day-old chicks were given a commercial starter basal ration with or without dienoestrol diacetate 0.005, thiouracil 0.1 and protamone 0.02 per cent., singly or together.

Protamone caused a highly significant depression of basal metabolic rate (B.M.R.) without decreasing the growth rate. It is suggested that this may have been because the chicks were in a temporary state of hypothyroidism during B.M.R. estimation, as they had been starved for at least 34 hr. beforehand. Thiouracil depressed growth and O_2 consumption, but had no effect on B.M.R. when the latter was corrected for bodyweight. The effect of the oestrogen was to increase the B.M.R. slightly and to neutralise the effect of thiouracil on growth.—M. J. Head.

See also Absts. 1729, 1862, 2499.

1978

JORPES, E. and RASTGELDI, S. **The insulin content of the human pancreas.** *Acta physiol. scand.*, 1953, **29**, 163-169. [Dept. Chem., Karolinska Inst., Stockholm.]

1979

APPEL, W. and HANSEN, K. J. Über den Abfall der veresterten Fettsäuren im Serum nach Insulingaben. Vorläufige Mitteilung. [The fall in the esterified fatty acids in the serum

after administration of insulin. Preliminary communication.] *Klin. Wochenschr.*, 1953, **31**, 861-862. [Med. Klin., Univ. Kiel.]

1980

BURRIS, M. J., BOGART, R. and KRUEGER, H. **Alteration of activity of thyroid gland of beef cattle with testosterone.** *Proc. Soc. Exp. Biol. Med.*, 1953, **84**, 181-183. [Dept. Animal Husb., Oregon Agric. Exp. Stat., Corvallis.]

A group of 6 heifers and 6 steers received no testosterone; animals of a similar group were injected intramuscularly with 1 mg. testosterone per kg. bodyweight. The average daily gain and feed requirement per unit gain for individual animals were recorded during growth from 500 to 800 lb. liveweight. When each animal reached 800 lb. it was slaughtered. The thyroids of 2 heifers and 2 steers in each group were macerated and injected into mice which had had for 4 weeks a ration containing 0.1 per cent. thiouracil. The mice were killed 36 hr. later; the time required for death by asphyxiation was used as an indication of the activity of the thyroids.

The cattle which had received testosterone had larger and more active thyroids with a lower hormone content than controls. The average daily weight gain of the control heifers was 2.09 lb. and that of the testosterone-treated heifers 2.61 lb. Gains for the steers were 2.65 and 2.74 lb., respectively, the differences being statistically significant.—B. W. Simpson.

ENERGY EXCHANGE AND SPECIFIC DYNAMIC ACTION

1981

KULIN, L. Eine neuartige Auffassung der Pathogenese der Säuglingsatrophie und die daraus abgeleitete Therapie. [A new concept of the pathogenesis of atrophy in infants, and the derived treatment.] *Ann. Paediat.*, 1953, **181**, 320-326. [Kinderklin., Univ. Debrecen.] English and French summaries.

It is suggested that the fundamental cause of atrophy in infants is disparity between anabolism and catabolism. Because of the excessive proportion of surface area to bodyweight, which becomes more marked as atrophy increases, there is increased loss of heat, for which the infant must compensate with a considerable part of his total energy output, so that weight increase is impossible. Since the capacity for assimilation is diminished the increased energy requirement cannot be met by increasing the food intake. The only practicable way is to diminish the loss of heat from the body surface and thus relieve the organism of the necessity of meeting the heat requirements from the food. If the infants are kept in air-conditioned

chambers at a temperature of 28° to 33° C., with a relative humidity of 55 to 70 per cent., the energy thus saved by heat regulation can be utilised for assimilation and weight increase. These theories were confirmed by results attained with 24 atrophic infants who had been treated without success for different periods at an average room temperature of 22° C. When they were brought into warm moist surroundings, 17 responded immediately, and the remaining 7 within a few weeks, with a constant ideal weight increase.—M. B. Richards.

1982

GARN, S. M., CLARK, L. C. (Jr.) and PORTRAY, R. **Relationship between body composition and basal metabolic rate in children.** *J. Appl. Physiol.*, 1953, **6**, 163-167. [Fels Res. Inst., Antioch Coll., Yellow Springs, Ohio.]

Estimates of body muscle and fat were obtained, by measurement from X-ray photographs made under standard conditions, of the lower leg and of the deltoid region of 49 boys and 46 girls aged 6 to 18 years. The estimated values, combined,

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were found to be correlated with basal oxygen consumption, the coefficients being $+0.79 \pm 0.06$ and $+0.67 \pm 0.09$, for boys and girls, respectively.

S. D. Morrison.

1983

UETA, T. [Studies on the basal metabolism of the Japanese. 3. On the basal metabolism of 14-year-old male.] *Shikoku Acta Med.*, 1952, 3, No. 6, 6-10. [Dept. Hyg., Sch. Med., Univ. Tokushima.] In Japanese: English summary.

One hundred healthy school boys aged from 14 years 11 months were examined. The average physiological data obtained were: body temperature 36.5°C ., respiration rate 16.4 per min., pulse rate 71.5 per min., expired air 5.91 litres per min., oxygen consumption 187.9 c.c. per min., CO_2 production 174.7 c.c. per min., R.Q. 0.93, basal heat production 1342.9 Cal. per day, 42.10 Cal. per sq. m. per hr. or 32.85 Cal. per kg. per day. The following correlation coefficients were established: body height and heat $+0.6629 \pm 0.0378$; bodyweight and heat $+0.8124 \pm 0.0229$; body surface and heat $+0.7842 \pm 0.0259$. (From summary.)

W. Godden.

1984

DRAPER, J., EDWARDS, R. G. and HARDY, R. H. **Method of estimating the respiratory cost of a task by use of minute-volume determinations.** *J. Appl. Physiol.*, 1953, 6, 297-303. [Clothing and Equipment Physiol. Res. Establishment, Minist. Supply, S. Farnborough, Hants.]

Respiratory minute volume, in litres, was measured from the total expired air of 2 successive 5-min. periods, in 9 men carrying loads of from 4 to 16 kg. on the back and from 0.6 to 2.4 kg. on the feet. The slopes of the regression lines of minute volume on weight carried on the back, and on weight carried on the feet, respectively, were $+0.400 \pm 0.039$ and $+0.926 \pm 0.158$. It is indicated that this might be a simple method of assessing the metabolic cost of a task. [No relation is given between minute volume and absolute energy expenditure.]—S. D. Morrison.

1985

COLE, P. **Further observations on the conditioning of respiratory air.** *J. Laryngol. Otol.*, 1953, 67, 669-681. [Dept. Physiol., Univ. Manchester.]

The results of experiments on a normally clothed subject at rest, breathing air at different temperatures and humidities, are presented graphically. It was concluded that losses from the respiratory tract form from 10 to 20 per cent. of total body heat and water loss; in temperate conditions, at a ventilation rate of 10 litres per min., from 250 to 350 Cal. and from 300 to 400 ml. water per 24 hr.—W. M. Deans.

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1986

VIGLIANI, E. C. and PASARGIKLIAN, M. Sul consumo energetico e sul rendimento respiratorio durante lavoro muscolare protratto. [Consumption of energy and respiratory activity during prolonged muscular work.] *Med. del Lavoro*, 1953, 44, 313-324. [Clin. Lavoro "Luigi Devoto", Univ. Milan.] English summary.

Four subjects performed a series of marches at rates of 0.8 to 7 km. per hr. on different gradients, for periods of up to 5 hr., with a portable ergometer. The air inspired was measured with a Tissot's spirometer and analysed every 30 to 60 min. with a Haldane apparatus. It was concluded that when the energy required by work is less than 8 Cal. per hr. per kg. bodyweight, the mechanical efficiency and the respiratory power are unaffected by the time of work and maintain their initial value for the duration of the test; that when the energy required by work is more than 8 Cal. per hr. per kg. bodyweight, the energy expenditure and respiratory ventilation increase with the prolongation of work so that mechanical efficiency and respiratory energetic power are progressively reduced. Therefore muscular work up to the intensity of 8 Cal. per kg. bodyweight per hr. can be carried out continuously for many hours (certainly for 5 hr.), whereas when the intensity of work is greater, fatigue sets in and is increased by a rise in the work intensity or by prolongation of the time of work. (From summary.)

E. M. Hume.

1987

MÜLLER, E. A. **The physiological basis of rest pauses in heavy work.** *Quart. J. Exp. Physiol.*, 1953, 38, 205-215. [Max-Planck Inst. Arbeitsphysiol., Dortmund.]

In this lecture are described the methods and apparatus used in the Max-Planck Institute to determine the length and number of pauses required in heavy work. One method is to give sufficient pauses to keep the average energy expenditure over the whole shift at a level of 4 Cal. per min., which is taken as the limit of working capacity. This method is crude, since the limit of energy expenditure differs for different patterns of work and for individuals with different degrees of muscular training. A more reliable method depends on measurement of pulse rate as an index of sufficient blood supply to the muscles, the chief necessity in avoiding fatigue. The aim is to keep the pulse rate during the shift at a constant average level. If work is done above the endurance limit, the pulse rate continues to rise, fatigue increases, and the recovery period is prolonged. This method has proved useful in arranging pauses so that a man may work within his endurance

limit. The pauses must be real pauses and any kind of movement retards recovery.

M. B. Richards.

1988

KRAUT, H. Leistungsfähigkeit und Ernährung. [Performance and diet.] *Gegenwartsprobleme der Ernährungsforschung, Symposium, Basle*, October 1952, 54-64 (with discussion 65-67). Verlag Birkhäuser, Basle, 1953. Price Swiss fr. 32. [Abt. Ernährungsphysiol., Max-Planck-Inst., Dortmund.]

1989

DE WIJN, J. F. and VAN LEEUWEN, P. De bijdrage van eiwitten, koolhydraten en vetten aan de totale calorische opnemings bij zware en lichte arbeid. [Contribution of proteins, carbohydrates and fats to total energy intake in heavy and light work.] *Voeding*, 1953, 14, 504-508. [Nederl. Inst. Praevent. Geneesk., Leyden.] English summary.

Analysis of the diets of 61 workers showed that 13 administrative, technical and laboratory workers had energy intakes between 2700 and 3300 Cal. and 1 had 4000 Cal.; 27 instrument makers had from 2300 to 4700 Cal. and of 20 heavy workers only 2 had less than 3300 Cal. There was no difference between groups arranged by energy intake in respect of the percentage of calories from protein; the mean was 12.0 per cent.—I. Leitch.

1990

DURNIN, J. V. G., GARRY, R. C., PASSMORE, R. and WARNOCK, G. M. The expenditure of energy and the consumption of food by miners and by clerks, East Fife, Scotland. *J. Physiol.*, 1953, 122, 54P. [Inst. Physiol., Univ. Glasgow.]

1991

HETTINGER, T. and WIRTHS, W. Über die körperliche Beanspruchung beim Hand- und Maschinenmelken. [Energy expenditure in hand and machine milking.] *Arbeitsphysiologie*, 1953, 15, 103-110. [Max Planck Inst. Arbeitsphysiol., Dortmund.]

A study was made with one woman milker managing a herd of 12 cows, of the relative pulse rate and energy expenditure in milking by hand and with a machine having 2 teat cups. The whole process, including hand stripping after machine milking and the work of preparing and cleaning the milking utensils, was studied. With machine milking there was a saving of 6 per cent. in time as compared with hand milking and 7.5 to 30 per cent. less increase in energy exchange and in pulse rate over the resting rates. It is considered that by further improvements in milking machines it should be possible to reduce the fatigue of milking still further.—W. Godden.

1992

BAL, M. E. R., THOMPSON, E. M., MCINTOSH, E. M., TAYLOR, C. M. and MACLEOD, G. Mechanical efficiency in cycling of girls six to fourteen years of age. *J. Appl. Physiol.*, 1953, 6, 185-188. [Nutrit. Lab., Teachers Coll., Columbia Univ., New York.]

The energy expenditure in standard cycling on a bicycle ergometer was measured in 54 trials on 18 girls. Net efficiency was estimated from measured values of basal energy expenditure and of energy expenditure of the girls sitting quietly. The efficiencies at each age were slightly less than those previously reported for boys (Abst. 3685, Vol. 20).—S. D. Morrison.

1993

YOUNG, C. M., RINGLER, I. and GREER, B. J. Reducing and post-reducing maintenance on the moderate-fat diet. *Metabolic studies. J. Amer. Dietetic Assoc.*, 1953, 29, 890-896. [Sch. Nutrit., Cornell Univ., Ithaca, N.Y.]

Six young college women, 11 to 48 per cent. overweight, were given for 10 weeks a reducing diet supplying 1400 Cal., 90 g. protein, 80 g. fat and 80 g. carbohydrate. During the next 5½ weeks energy intake was increased until there was no loss of weight. All diets contained 1 g. Ca and 1.5 g. P daily and met or exceeded the U.S. National Research Council allowances of other nutrients. B.M.R. and N, Ca and P balances were estimated near the beginning and end of reducing and in the fourth week of the post-reducing period.

In 10 weeks the subjects lost from 14 to 26 lb. The B.M.R., which fell by 8 per cent. between the first and second estimations, was still low after 4 weeks on the maintenance diet. Most subjects were in negative Ca, P and N balance at the end of reducing, but 4 weeks later all were in retention or balance for N and only one subject remained in negative Ca or P balance.

There was a tendency for fasting blood lipids to increase somewhat during weight reduction and slightly thereafter.

Possible advantages of a step-wise reducing regimen are considered.—F. C. Aitken.

1994

MAURER, H. and SECKFORTH, H. Die Gesamtstoffwechselwirkung des Inosit. [General metabolic action of inositol.] *Klin. Wochenschr.*, 1953, 31, 911-912. [Med. Klin., Johannes Gutenberg Univ., Mainz.]

The basal metabolism was estimated of 42 healthy persons, 2 with Graves' disease and one with severe wasting, before and at intervals of 10 to 85 min. after intravenous injection of 2 or 4 g. inositol dissolved in 20 or 40 ml. saline, or 20 ml.

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saline only. The results after administration of 2 g. were inconsistent, but after 4 g. there was a decrease of 15 to 25 per cent.—E. M. Hume.

1995

NOACH, E. L. **Estimations of the metabolic rate in rats.** *Acta physiol. pharmacol. neerl.*, 1953, **3**, 95-99. [Pharmacol. Lab., Univ. Leyden.] French and German summaries.

The O₂ consumption of resting, fasted male rats of weight 50 to 280 g. was 11.9 ± 0.2 c.mm. per sq. cm. per min. In rats with alloxan diabetes there was no significant increase and the R.Q. remained almost unaltered.—W. Godden.

1996

MORRISON, S. D. **Total expenditure of energy by adult non-pregnant female rats.** *J. Physiol.*, 1953, **122**, 47P-48P. [Inst. Physiol., Univ. Glasgow.]

1997

SHUMSKII, P. I. Vliyanie kratnosti kormleniya na uglevodnozhirovoi obmen u rabotayushchikh loshadei. [The effect of frequent feeding on carbohydrate-fat metabolism in working horses.] *Konevodstvo*, 1953, No. 6, 16-20. [Opyt. Konnyi Zavod VNIIEK.]

Six horses aged 7 to 10 years, in 2 groups, were fed 3 times during the night. During the day 1 group was fed only during the dinner hour, the other 3 times and 4 times during 10- to 15-min. intervals of work. Oxygen and CO₂ were estimated in the expired air. More frequent feeding increased the proportion of carbohydrate metabolism and reduced fat metabolism.

In the first test the horses were fed on a mixture of 52 to 70 kg. vetch and oats, in the second on 8 to 9½ kg. oats and 11 to 16 kg. hay. In the first test, among the horses fed 6 times daily, the percentage of carbohydrate metabolised in 6 hours' work was 44.69, among those fed 4 times, 34.67. In the second test in 6 hours 40 minutes' work the proportions were 37.39 and 29.03 per cent. The 10 to 15 minutes' extra feeding had a stimulating effect on metabolism, especially of carbohydrates.

E. W. Birse.

1998

McDOWELL, R. E., LEE, D. H. K., FOHRMAN, M. H. and ANDERSON, R. S. **Respiratory activity as an index of heat tolerance in Jersey and Sindhi × Jersey (F₁) crossbred cows.** *J. Animal Sci.*, 1953, **12**, 573-581. [Bur. Dairy Indust., U.S. Dept. Agric., Beltsville, Md.]

Two groups of 20 purebred Jersey and 20 Red Sindhi × Jersey cows were used. The groups were similar in age, bodyweight, reproductive state and level of production. Initial measurements of

rectal temperature, respiratory rate and respiratory volume were made at normal temperatures, 57° to 84° F. The cows were then exposed to a temperature of 105° F. with a vapour pressure of 34 mm. Hg. for 3 hr., during which time they received no feed or water.

The heat tolerance of the crossbred cows proved superior to that of the purebred Jerseys. The respiratory volume of the Jerseys was higher and increased to a greater extent than that of the crosses. The rectal temperature of the purebred Jerseys also rose significantly above that of the crosses, despite the additional cooling effect to be expected from the increased respiratory volume. There was a highly significant positive correlation between rectal temperature and respiratory volume, except in lactating animals maintained at normal temperatures.

It was concluded that the superior heat tolerance of the crosses could not be ascribed to greater respiratory response, but the increased respiratory activity of the pure Jerseys was an attempt to compensate for a poor heat balance due to some other cause. There was no significant correlation between respiratory rate and rectal temperature.

The method of measuring respiratory volume is described in detail.—J. N. Aitken.

1999

WORSTELL, D. M. and BRODY, S. **Environmental physiology and shelter engineering with special reference to domestic animals. 20. Comparative physiological reactions of European and Indian cattle to changing temperature.** *Missouri Agric. Exp. Stat. Res. Bull.* No. 515, January 1953, pp. 42. [Columbia, Mo.]

This is a statistical study of the more significant physiological data already published on the effect of temperature while other climatic conditions are constant (*cf.* Absts. 1789, 1840, Vol. 23; 5049, Vol. 21). It is concerned with the mechanisms involved in regulating the internal body temperature in the face of changing environmental temperature. Jersey, Holstein and Brown Swiss represented the European cattle and Texas-bred Brahman the Indian cattle. Data obtained in 5 experiments during periods of increasing temperature from 50° to 105° F. and decreasing temperature from 50° to 5° F. are included. Except at high temperatures the cows were kept at each temperature level at intervals of 5° or 10° F. for about 2 weeks.

Normal body temperature was maintained without serious aid from physical or chemical homeothermic mechanisms between about freezing and 60° F., but the precise range depended on the productive level. The higher the productive level and the larger the individual, the greater the cold tolerance and the lower the heat tolerance.

Fall in temperature to near 0° F. had no effect on the heat production of Holstein cows, but increased both heat production and feed consumption in the Brahmans and to some extent in the Jerseys. The declining temperature gradually reduced the rates of respiration, pulmonary ventilation and moisture evaporation in the European cows. No other change was observed. Rising temperature affected the European animals profoundly above 60° F., when the respiration and moisture evaporation rates were suddenly accelerated, reaching a maximum at about 85° F. Rectal temperature in high-producing European cows began to rise at about 70° F. and this was followed by decrease in feed consumption, milk production, heat production, pulse rate, blood CO₂-combining power and ascorbic acid content, and increase in blood creatinine. This low heat tolerance appears to be associated with low moisture vaporisation and high heat production relative to surface area. The Brahman cows lagged behind the European cows by about 15° F. before a rise of rectal temperature and other physiological reactions appeared, owing to their 12 per cent. greater surface area per unit weight and lower heat production. As the environmental temperature approached 105° F. the distress of Indian cows approached that of European cows. Brown Swiss cows, although of the same body-weight and milk yield as Holsteins, appeared to be much more tolerant of heat. There appears to be more urgent need for protecting cattle against temperatures above 80° F. than against temperatures below freezing or even 0° F.

W. Godden.

2000

KIBLER, H. H. and BRODY, S. **Environmental physiology and shelter engineering with special reference to domestic animals. 22. Influence of humidity on heat exchange and body temperature regulation in Jersey, Holstein, Brahman and Brown Swiss cattle.** *Missouri Agric. Exp. Stat. Res. Bull.* No. 522, April 1953, pp. 35.

Methods of measurement and apparatus employed have already been described (Absts. 578, Vol. 20; 2150, Vol. 21). Changes in atmospheric humidity at constant temperature levels of 12° and 40° F., and at air velocity of about $\frac{1}{2}$ mile per hr., produced no consistent effect on heat production, evaporative cooling from the respiratory tract and body surface, rectal temperature, respiration rate, pulse rate or pulmonary ventilation rate in Jersey and Holstein cattle. Increasing atmospheric humidity increased the rectal temperature in Jersey, Holstein and Brown Swiss cows and Brahman cattle at environmental temperatures above 75° F. and above 90° to 95° F., respectively; increased the respiration in the first 3 breeds at above 85° F. and in Brahman cattle at above 90° to

95° F.; increased pulmonary ventilation rate at 85° to 100° F. in Jersey, Holstein and Brown Swiss cattle and at 95° to 100° F. in Brahman cattle; produced no consistent effect on pulse rate; depressed heat production in all cattle at 85° F. and depressed respiratory vaporisation rate at temperatures above 85° F., particularly in Holstein and Brown Swiss; and depressed vaporisation rate from the skin or outer surface in Jersey, Holstein and Brown Swiss cattle at temperatures from 75° to 95° F. and in Brahmans above 90° to 95° F.—W. Godden.

2001

BARISSON VILLARES, J. and BERTHET, L. A. *Climatologia zootécnica. 13. Contribuição para a demonstração do funcionamento das glândulas sudoríparas nos *Bos taurus* e *Bos indicus*.* [Climatology of animal production. 13. Contribution to demonstration of the function of sweat glands in *Bos taurus* and *Bos indicus*.] *Bol. Indust. animal, São Paulo*, 1952, **13**, 25–36. [Div. Zootec. Nutrição Animal.] English summary.

The presence of moisture and of chloride on the skin of cattle was demonstrated by application to the surface, depilated and washed with distilled water, of iodine and then a mixture of soluble starch in castor oil, or of paper impregnated with a 3 per cent. solution of silver nitrate. The appearance of blue spots or a precipitate of silver oxide indicated the passage of water or chloride out of the skin, mostly round the hair follicles, and is interpreted as showing that the sweat glands do function. Cattle tested were 10 different pure- or crossbred *Bos taurus* and 8 *Bos indicus*. Temperatures were from 22.6° to 33.0° C., under cover, and relative humidity from 63 to 75.—I. Leitch.

2002

GRAF, G. C. and PETERSEN, W. E. **Changes in respiration and heart rates, body temperatures, plasma lactic acid levels and plasma creatinine levels caused by stress in dairy cattle.** *J. Dairy Sci.*, 1953, **36**, 1036–1048. [Dept. Dairy Husb., Univ. Minnesota, St. Paul.]

The effects of low environmental temperature, exercise, intermittent electrical stimulation, dehorning, adrenaline injection and parturition on body temperature, respiration and heart rates and blood lactic acid and creatinine levels in cattle were studied in 12 sets of identical twins and 2 of identical triplets. Not all were subjected to each treatment. One of each set was used as a control.

When animals were exposed to outside temperatures from +16° to –16° F. heart rates increased by 12.4 per cent. and blood lactic acid by 36.4 per cent. Temperature increased by 0.8° F. Vigorous exercise for 10 min. caused significant increases in

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respiration and heart rates, and lactic acid increased on the average by 272.7 per cent. Plasma creatinine levels were unaffected. Electrical stimulation increased heart rate, but had no effect on plasma creatinine. Heart rate was also increased by dehorning.

Injection of 1 or 2 ml. adrenaline caused a significant increase in blood lactic acid. An increase in heart rate 15 sec. after injection was followed by a decrease after 60 sec. Respiration rate decreased.

Respiration and heart rates, temperature and plasma lactic acid increased on the day of calving, but quickly returned to normal.—J. N. Aitken.

2003

HOLMES, J. H., MONTGOMERY, A. V., ZEAVIN, I., PREVEDEL, A. E. and SWAN, H., II. **Metabolic changes in hypothermia.** *J. Lab. Clin. Med.*, 1953, **42**, 816-817. *Proc.* [Denver, Colo.]

A study with dogs.

2004

LYON, J. B. (Jr.), DOWLING, M. T. and FENTON, P. F. **Studies on obesity. 2. Food intake and oxygen consumption.** *J. Nutrition*, 1953, **51**, 65-70. [Brown Univ., Providence, R.I.]

Male mice of C_{57} and C_3H strains were fed individually and to appetite on a diet of casein 30, maize oil 5, salt mixture 5 and dextrin 60 per cent., or the same with three-quarters of the dextrin replaced by Crisco. There were 12 mice of each strain on each diet. Food intake was recorded for 9 days at the outset and again at 5 to 6 months, and oxygen consumption was estimated at ages between 55 and 85 and between 120 and 135 days.

Voluntary energy intake was higher on the diet with 50 per cent. than on that with 5 per cent. fat. On both diets C_3H mice consumed more food daily than C_{57} mice, and they gained weight more rapidly. For weanling mice efficiency of food utilisation was higher on the high-fat diet; there was no strain difference. At the later age this comparison could not be made because the weight range of the animals was too great. With the low-fat diet there was no significant strain difference in oxygen consumption. C_{57} mice on the high-fat diet consumed significantly more oxygen than C_{57} mice on the low-fat diet. There was no such difference in the C_3H mice, in which, as was shown in the previous paper (Abst. 4867, Vol. 23), the extra energy consumed was deposited as carcass fat.—W. M. Deans.

2005

RUBINO, F. Comportamento del dispendio energetico nel corso della rialimentazione dopo ipoalimentazione calorica. [Expenditure of energy during re-feeding after caloric under-feeding.] *Arch. Fisiol.*, 1953, **53**, 55-73. [Ist. Fisiol., Univ. Palermo.]

See Abst. 4537, Vol. 23.

2006

MCBIRNIE, J. E., PEARSON, F. G., TRUSLER, G. A., KARACHI, H. H. and BIGELOW, W. G. **Physiologic studies of the groundhog (*Marmota monax*).** *Canad. J. Med. Sci.*, 1953, **31**, 421-430. [Dept. Surg., Banting Inst., Univ. Toronto.]

Effects of cold and hibernation on the blood composition and peripheral circulation were studied.

D. Duncan.

See also Absts. 1563, 1833, 1973, 1974, 1977, 2195.

CARBOHYDRATES

2007

WILLIAMS, R. T. (Ed.) **Biological transformations of starch and cellulose.** *Biochem. Soc. Symposia* No. 11, 1953, pp. 84.

2008

VAN DER LINDEN, A. C. De citroenzuurecyclus. [The citric acid cycle.] *Voeding*, 1953, **14**, 532-539. [Netherlands Inst. Volksvoeding, Amsterdam.] English summary.

A review.

2009

DESMOND, M. M. **Observations related to neonatal hypoglycemia.** *J. Pediat.*, 1953, **43**, 253-262. [Dept. Paediat., Baylor Univ. Coll. Med., Houston, Tex.]

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In full term and premature newborn infants blood sugar rose in response to adrenaline. The increase was smaller and less rapid in the first few days of life than at the end of the first week. The response to intravenous glucose was within the normal limits for older children and adults and serum inorganic P did not fall appreciably. Blood glycogen levels were within the normal adult range. No relation could be demonstrated between the eosinophil and blood sugar responses to adrenaline. These observations are discussed in relation to the origin of neonatal hypoglycaemia.—F. C. Aitken.

2010

PEDERSEN, J. **Blood sugar during the first day of life in infants of diabetic mothers.** *Acta paediat.*, 1953, **42**, 474-475. *Proc.*

2011

MOREAU, R., BONFILS, S., DEUIL, R., DE TRAVERSE, P. M. and HADJISSOTIRIOU, G. L'épreuve de tolérance au glucose avec dosage simultané de la glycémie et de la pyruvicémie chez les diabétiques. [The glucose tolerance test with simultaneous estimation of glucose and pyruvic acid in the blood in diabetic persons.] *Presse méd.*, 1953, **61**, 1379-1380. [Paris.]

Glucose and pyruvic acid were estimated in fasting blood samples and in samples taken 30, 60, 90 and 120 min. after administration of 50 g. glucose by mouth.

In 9 normal subjects, blood glucose and pyruvic acid increased together, but the peak of glucose concentration was at about 30 min. and that of pyruvate at 60 min. The mean fasting pyruvate was 7.6 mg. per 1000 g. and the peak never exceeded 12.8 mg. In 14 of 25 diabetics the fasting pyruvate was 10.6 mg. and the peak not more than 13 mg., despite a mean fasting blood sugar of 2.15 g. per 1000 g. In the other 11 the fasting pyruvate was 14 mg. and the level gradually rose after glucose administration to 15.6 mg. at 150 min., whereas the blood sugar rose from its fasting level of 3.09 g. to a peak of 4.34 g. at 60 min. and thereafter declined. Clinical examination showed that the subjects with low blood pyruvate were moderately insulin-sensitive, only one had had coma, and 4 were familial diabetics. Among those with high pyruvate 9 were receiving insulin and were insulin-resistant, coma was relatively frequent and none came from a diabetic family. The significance of the 2 types of diabetes is discussed.

D. Duncan.

2012

SCHREIER, K., PLÜCKTHUN, H. and HAUSS, H. Über den Einfluss von Monosacchariden auf den Stickstoff-Stoffwechsel bei Säuglingen. [Effect of monosaccharides on the nitrogen metabolism of infants.] *Ztschr. Kinderheilk.*, 1953, **73**, 526-531. [Kinderklin., Univ. Heidelberg.]

The influence of glucose and fructose on N metabolism was studied in 5 infants aged from 5 to 11 weeks, who were given a synthetic diet in which the only carbohydrate was the sugar in question. The results indicated that fructose given by mouth was in no way superior to glucose in N-sparing effect. In 3 of the infants no significant difference was found between the sugars in the urinary excretions of N, amino-N and amino-acids, but in 2 the total urinary N was 620 and 1450 mg. higher in 3 days of fructose feeding than with glucose; the baby with the highest N excretion had also a distinctly higher excretion of amino-N, histidine, threonine and tryptophan. The weight increase of the children in 6 days was higher with glucose than with fructose. In a

second series of experiments the urinary N excretions in 2 out of 3 infants were about 800 and 840 mg. less in 3 days with glucose than with fructose. M. B. Richards.

2013

WEICHSELBAUM, T. E., MARGRAF, H. W. and ELMAN, R. Metabolism of intravenously infused fructose in man. *Metabolism*, 1953, **2**, 434-449. [Dept. Surg., Sch. Med., Washington Univ., St. Louis, Mo.]

2014

MENDELOFF, A. I. and WEICHSELBAUM, T. E. Role of the human liver in the assimilation of intravenously administered fructose. *Metabolism*, 1953, **2**, 450-458. [Nutrit. Res. Lab., Dept. Prevent. Med., Sch. Med., Washington Univ., St. Louis, Mo.]

2015

DAUGHADAY, W. H. and WEICHSELBAUM, T. E. Utilization of intravenous fructose in diabetic acidosis and in a pancreatectomized human. *Metabolism*, 1953, **2**, 459-467. [Dept. Med., Sch. Med., Washington Univ., St. Louis, Mo.]

2016

SOLDATENKOV, P. F. Obmen sakhara i glikogena mezhdru krovyu kishechnikom i pechenyu u ovets. [The exchange of sugar and glycogen between blood, intestine and liver in the sheep.] *Fiziol. Zh. S.S.S.R. Sechenova*, 1953, **39**, 96-99. [Kaf. Fiziol. Sel'skhoz. Zhivot., Sel'skhoz. Inst., Sverdlovsk.]

Sugar and glycogen exchange between the walls of the digestive tract and the blood, and also between the liver and the blood, occurs rhythmically in sheep 18 to 23 hr. after feeding. Transfer of sugar from liver to blood is usually accompanied by removal of glycogen from the blood. Transfer of sugar or glycogen from the digestive tract to the blood is accompanied by removal of sugar or glycogen, respectively, by the liver. The digestive tract and liver of sheep on an "empty stomach" retain glycogen and do not give it up to the blood. (From author's summary.)—W. Hughes.

2017

JARRETT, I. G. and POTTER, B. J. Insulin tolerance and hypoglycaemic convulsions in sheep. *Austral. J. Exp. Biol. Med. Sci.*, 1953, **31**, 311-318. [Div. Biochem., C.S.I.R.O., Univ. Adelaide, S. Australia.]

Large amounts of insulin given intravenously to normal adult sheep fasted for 1 to 4 days reduced the blood sugar to less than 10 mg. per 100 ml., but even when this low level was maintained for 15 to 18 hr. convulsions were not induced. In 2 adult sheep and 3 lambs in which the adrenals

were denervated insulin sensitivity was increased and convulsions could be produced by quite small doses of insulin, *e.g.*, 4 units per kg. bodyweight in adults. In normal lambs sensitivity was high a few hours after birth, but decreased with age.

Subcutaneous administration of insulin in adults and lambs was more effective than intravenous injection. Of 17 adult sheep given subcutaneously 3 to 5 units per kg., 14 had convulsions and 8 of these failed to recover despite treatment with glucose. The other 3 became comatose. On 3 occasions when the sheep was apparently approaching an irreversible state, usually refractory to glucose treatment, a better clinical response resulted from simultaneous injection of glucose and adrenaline.—D. Duncan.

2018

MURRAY, H. C. and ROSENBERG, M. M. **Studies on blood sugar and glycogen levels in chickens.** *Poultry Sci.*, 1953, **32**, 805–811. [Dept. Foods and Nutrit., Univ. Hawaii, Honolulu.]

The average blood sugar value of 34 mature pullets was found to be 182.5 mg. per 100 ml., falling to the significantly lower value of 159.6 after 3 hr. fasting, but not significantly lower during a further 13 hr. When birds that had been fasted for 16 hr. were fed, the blood sugar rose within 1 hr. from the fasting level of 148 to 176 mg. per 100 ml. No difference in blood sugar was observed with different rations.

Six-week-old cockerels were fasted for 16 hr. and were then given cracked yellow maize or low-grade sugar to appetite. Glycogen was estimated in chicks killed hourly for 10 hr., on livers, breast and lower thigh muscles, none of which contained glycogen at the end of the fast. The glycogen content of the livers of birds fed on maize rose to 6.07 per cent. after 7 hr. and then fell slightly; the livers of those fed on sugar contained 10.33 per cent. glycogen after 10 hr. The glycogen values of the muscles showed no difference attributable to the ration.—M. J. Head.

2019

BLOOM, B., STETTEN, M. R. and STETTEN, D. (Jr.) **Evaluation of catabolic pathways of glucose in mammalian systems.** *J. Biol. Chem.*, 1953, **204**, 681–694. [Div. Nutrit. Physiol., Pub. Health Res. Inst. City of New York, Inc.]

2020

BAKER, D. G. and SELLERS, E. A. **Carbohydrate metabolism in the rat exposed to a low environmental temperature.** *Amer. J. Physiol.*, 1953, **174**, 459–461. [Dept. Physiol., Univ. Toronto, Ont.]

In rats acclimatised to cold at 1° to 3° C., the glycogen content of heart, liver, diaphragm and

fat from perirenal and interscapular regions was less than in controls kept at room temperature, but the difference in the diaphragm was not significant. The glycogen content of skeletal muscle did not differ significantly in the two groups, which suggested that the level of muscle glycogen was maintained at the expense of liver glycogen reserves. During the process of acclimatisation and the entire period of observation no great change occurred in blood sugar level. Insulin administration caused a greater reduction of blood sugar in animals exposed to cold than in controls, at dose levels from 0.1 to 0.6 unit per 100 g. bodyweight. These results are probably related to the greatly increased rate of metabolism in animals exposed to cold and the associated increase in utilisation of carbohydrate.—M. B. Richards.

2021

REISS, O. K. and BARRY, J. M. **The synthesis of lactose from glucose in the mammary gland.** *Biochem. J.*, 1953, **55**, 783–785. [Dept. Biochem., Univ. Chicago.]

Glucose labelled uniformly with ¹⁴C was injected intravenously into a goat giving about 1 litre of milk daily. Milk and blood samples were taken at intervals during the next 12 hr.

The specific activities of the glucose and galactose fractions of each lactose sample were the same. The activity of the lactose, after it reached its peak at 1 to 2 hr. after the injection, was always equal to that of the blood glucose about 1 to 1.5 hr. earlier.

It is concluded that blood glucose is the precursor of both glucose and galactose residues of milk lactose.—D. Duncan.

2022

LANG, K. and PFLEGER, K. **Über die Verwertbarkeit von Lichenin durch den tierischen Organismus.** [Utilisation of lichenin by the animal organism.] *Biochem. Ztschr.*, 1953, **324**, 530–535. [Physiol. Chem. Inst., Johannes Gutenberg Univ., Mainz.]

When lichenin replaced the 70 per cent. of starch in a ration for rats they ceased to grow and 6 out of 10 died in the first 14 days. The lichenin was not utilised as a source of carbohydrate and the mucous membranes of the rat's intestine did not contain any lichenase. Only a small amount of lichenin was recovered in the faeces, most of it being degraded by intestinal bacteria. When lichenin was given to alloxan-diabetic rats there was no extra excretion of glucose. Lichenin administered parenterally was stored in the leucocytes and the reticulo-endothelial system of the liver.—W. Godden.

See also Absts. 1790, 1906, 1910, 1919, 2150, 2169, 2170, 2201.

PROTEINS AND PROTEIN DERIVATIVES

- 2023
SHAH, K. A. **Proteins in nutrition.** *Antiseptic*, 1953, **50**, 555-567. [Ahmedabad.]
- 2024
JACQUOT, R. La synthèse protéique. [**Protein synthesis.**] *Biol. méd.*, 1953, **42**, 1-54. [Lab. Biochim. Nutrit., C.N.R.S., École Hautes-Études, Paris.]
- 2025
RONDONI, P. Alcuni problemi di sintesi delle proteine. [**Problems of protein synthesis.**] *Sperimentale*, 1953, **103**, 1-14. [Ist. Studio e Cura Tumori, Milan.]
A review.
- 2026
EVANS, R. L. and AMATUZZIO, D. S. **Protein metabolism and interactions.** *Science*, 1953, **118**, 558-560. [Dept. Mechanics and Materials, Univ. Minnesota.]
Mathematical treatments of data from experiments by other workers on protein metabolism and interaction, using ^{15}N , are discussed.
C. Warner.
- 2027
CHINN, A. B., LAVICK, P. S., BABB, L. I., BUCKALOO, G. W., STITT, R. M. and ABBOTT, W. E. **Blood isotope levels following a test meal of ^{131}I -labelled protein.** *J. Lab. Clin. Med.*, 1953, **42**, 377-379. [Dept. Med., Sch. Med., W. Reserve Univ., Cleveland, Ohio.]
For previous papers see Abst. 3068, Vol. 23, and Chinn *et al.* (*New Engl. J. Med.*, 1952, **247**, 877). The test meal was similar to that described in the second of these, but albumin labelled with ^{131}I was substituted for labelled casein and gelatine for inactive casein. Each patient received 0.5 g. gelatine per kg. bodyweight and 100 μC . labelled albumin. Blood samples were taken 1, 2 and 3 hr. after the test meal.
In 9 normal subjects and 7 who had undergone subtotal gastrectomy at least 10 per cent. of the isotope was in the blood at the second hour, and all but one showed maximum activity in the blood within 3 hr. None of the 3 patients with pancreatic insufficiency showed more than 3 per cent. of the dose in the blood. It is thought that the method offers a simple procedure for detection of defects in both rate and extent of protein digestion or absorption.—D. Duncan.
- 2028
PACOVSKÝ, V. Proteinurie při letním táboření dětí a jejich praktický význam. [**Proteinuria of children in summer encampments and its practical significance.**] *Čas. Lék. čes.*, 1953, **92**, 911-915. [3. Clin. Int. Med., Karl's Univ., Prague.] Russian summary.
- 2029
KRAUT, H., MÜLLER, E. A. and MÜLLER-WECKER, H. Die Abhängigkeit des Muskeltrainings und des Eiweissansatzes von der Eiweissaufnahme und vom Eiweissbestand des Körpers. [**Dependence of muscle training and protein storage on protein intake and the protein reserves of the body.**] *Biochem. Ztschr.*, 1953, **324**, 280-294. [Max Planck Inst., Arbeitsphysiol., Dortmund.]
Earlier work (see Abst. 5073, Vol. 19; 2173, Vol. 20) suggested that trained subjects could not be maintained in a state of fitness for heavy work on 1 g. protein per kg. bodyweight daily. Another study is now reported on 2 well fed subjects trained on an abundant diet with 2 g. protein per kg. bodyweight so that they doubled their muscular power in 3 months. During that time 8.3 kg. of protein tissue was laid down, as estimated from N balances. During the next 80 days, with only 1 g. per kg. bodyweight, protein stores were further increased by 1.5 kg., and in the following 49 days with only 0.8 g. per kg. N equilibrium was maintained without loss of weight or of muscle power.
I. Leitch.
- 2030
WATERHOUSE, C., KEUTMANN, E. H. and FENNINGER, L. D. **The use of modified globin as a protein supplement in normal individuals.** *J. Clin. Invest.*, 1953, **32**, 964-971. [Dept. Med., Sch. Dent., Univ. Rochester, N.Y.]
Modified globin prepared from human red cells by partial hydrolysis was given by vein to 4 subjects to supplement a low-protein diet. Metabolic studies were similar to those made previously with serum albumin (Abst. 2292, Vol. 19). Globin was estimated in plasma and urine.
Administration of 4 or 2 units globin daily caused nausea and vomiting and, after 8 days, refusal of food in 3 subjects. The fourth subject refused food after 3 days at 4 units daily, but ate all his diet for 10 days of 2 units daily, despite nausea. The results indicated that globin was readily metabolised and was efficiently converted to tissue protein until energy intake became inadequate.
One unit of globin contained 2.4 g. N.
F. C. Aitken.
- 2031
GABUZDA, G. J. (Jr.), PHILLIPS, G. B. and DAVIDSON, C. S. **Nutritive adequacy and clinical tolerance of modified human globin.** *J. Clin. Invest.*, 1953, **32**, 899-908. [Thorndike Mem. Lab., Boston City Hosp., Mass.]

The average N content of samples of modified human globin was 15.7 per cent. Analysis for essential amino-acids showed a low content of isoleucine. When globin furnishing 9.6 g. N daily was injected intravenously for 8 and 11 days, respectively, into 2 subjects on a protein-free diet adequate in energy, bodyweight and N balance were maintained whether or not isoleucine was given by mouth. When an equivalent amount of food protein was subsequently given by mouth no change ensued. Administration of globin by vein to 3 men on constant diets containing protein caused N retention to increase. When globin was withdrawn after 5 or 6 days N retention decreased. Two of these men were then given by mouth protein supplements equivalent to the amount of globin, whereupon N retention increased as before. A sixth man given by vein an amino-acid mixture equivalent in N content to the globin previously given by vein showed a smaller positive N balance than with the globin.

Approximately 25 per cent. of infused globin was excreted in urine as protein. Significant qualities of globin were not detected in serum 24 hr. after globin administration, and the rise in plasma and urinary α -amino-N after infusion suggested rapid metabolism of globin. In clinical tolerance tests 20 subjects who received daily infusions of 16 or 32 g. globin for several days showed frequent occurrence of transient flushing, pruritus and mild pyrogenic reactions but no serious reaction.—F. C. Aitken.

2032

MAGEE, D. F., KIM, K. S. and IVY, A. C. **Effect of dietary protein on the fat content of feces.** *Amer. J. Physiol.*, 1953, **175**, 310–312. [Dept. Clin. Sci., Chicago Professional Coll., Univ. Illinois.]

Purified diets were given to dogs and to rats. The dogs had 9 or 27 per cent. maize oil or none, and 2 levels of casein, the lower 14 or 20 and the higher 40 per cent.; the diets were changed over so that data were available for the same animals on low and high intakes of casein. The rats were in 2 groups on diets containing cellu flour 3.5, salt mixture 3.5 and maize oil 6 per cent., one of which contained 16 and 71 per cent. and the other 70 and 17 per cent. of casein and sucrose, respectively.

In both species the fat content of faeces was significantly lower with the high than with the low casein intake. The causes suggested are increases in output of cholate, or in production of pancreatic lipase, or both.—D. Harvey.

2033

YULE, C. L., LUCAS, F. V., JONES, C. K., CHAPIN, S. J. and WHIPPLE, G. H. **Inflammation and protein metabolism studies of carbon-14-**

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labeled proteins in dogs with sterile abscesses. *J. Exp. Med.*, 1953, **98**, 173–194. [Dept. Pathol., Sch. Med. Dent., Univ. Rochester, N.Y.]

After production of sterile abscesses by subcutaneous injection of turpentine, dogs were given ^{14}C -labelled plasma from a donor dog by vein or by mouth, or a mixture of amino-acids containing lysine- ϵ - ^{14}C by mouth. There was less absorption of ^{14}C from labelled protein given by mouth than in controls without abscesses, presumably because of impaired digestion. Turnover of albumin and fibrinogen was considerably increased, though globulin turnover was normal. Elimination of ^{14}C as CO_2 was increased, particularly during the period of high fever and accelerated albumin turnover, before localisation of the abscesses and decline in fibrinogen concentration. In dogs given ^{14}C by mouth there was also increased $^{14}\text{CO}_2$ elimination during absorption. Urinary excretion of ^{14}C was unaltered.

The appearance of ^{14}C in new red blood cells was much reduced, particularly when the ^{14}C was injected. The pus from the sterile abscesses contained roughly as much ^{14}C activity as the liver. The supernatant fluid had an activity proportional to that of the plasma, i.e., greater when the ^{14}C was given intravenously; the activity of the pus cells was the same whatever the source of ^{14}C . There was a reduction in labelling of skin, hair and skeletal muscle compared with controls, and relatively greater activity of liver and kidney.

C. Warner.

2034

WEAKLEY, C. E. (Jr.), HARE, J. H., ANDERSON, G. C., BLETNER, J. K. and MASON, J. A. **Protein utilization studies with simplified rations. 1. Ad libitum feeding of low nitrogen rations.** *Poultry Sci.*, 1953, **32**, 927. *Proc. [W. Virginia Agric. Exp. Stat., Morgantown.]*

2035

SILICIANO, A. M. and NASSET, E. S. **Nitrogen balance and growth of the rat as affected by certain fruits in the diet.** *J. Nutrition*, 1953, **51**, 403–411. [Dept. Physiol., Sch. Med. Dent., Univ. Rochester, N.Y.]

Groups of 5 and 6 adult rats were given diets containing 2.5 and 5 per cent. protein, respectively, derived equally from casein and dried banana. In the diets of control pair-fed rats all the protein was in the form of casein; cellulose flour and banana ash were included to make the diets resemble the experimental diets in non-protein components. Similar inclusions were made in protein-free diets given to groups of 10 and 12 rats. With both 2.5 and 5 per cent. protein, N balance was the same for casein and casein plus banana diets, but utilisation of absorbed N was

higher in rats given banana as source of half of the N intake. In further trials neither the water-soluble nor the water-insoluble fraction of banana influenced N balance in adult rats given diets in which casein was the source of protein.

Addition of banana fractions or inclusion of 9 per cent. fresh fruit pulp solids from banana, pineapple or apple in diets containing 10 per cent. protein from casein did not affect the rate of growth of weanling rats fed to appetite.

F. C. Aitken.

2036

FISCHER, M. A. and GARRITY, G. C. **Protein metabolism in the choline-deficient rat. 1. Effect of choline on serum proteins.** *J. Biol. Chem.*, 1953, **204**, 759-767. [Dept. Physiol. Chem., Sch. Med., Univ. Pittsburgh, Pa.]

Rats fed on a basal diet containing 18 per cent. casein, with fat, sucrose, salts and vitamins, developed fatty livers after 3 days and haemorrhagic enlargement of the kidneys after 6 days. Addition of 2 mg. choline daily reduced kidney damage, but had little effect on the liver lipid content; increasing the choline to 6 mg. daily reduced the liver lipid almost to normal. Serum proteins were estimated electrophoretically. In all the experimental animals the albumin was lower during the first 5 days than in controls on a stock diet; after a transient rise there was another fall for a few days in animals on the basal diet only; it is suggested that this was associated with the kidney damage. The α -globulins and possibly the β_1 -globulins, and also the phospholipin content, were increased after about the 8th day in rats on the basal diet. The β_2 -globulins were slightly higher in rats given choline than in those on normal or basal diets. γ -Globulins showed a slight increase in animals given choline after 6 days on the basal diet.—C. Warner.

2037

HELLER, H. and BLACKMORE, K. E. **Absence of correlation between fatty changes in the liver and impairment of water diuresis in protein-deficient mice.** *Brit. J. Nutrition*, 1953, **7**, 349-356. [Dept. Pharmacol., Univ. Bristol.]

Adult male mice received a stock diet for 4 weeks before experimental diets were given. The experimental control diet, SF, contained, per cent., casein 18, wheat starch 63, groundnut oil 12, cod liver oil 3, salt mixture 4, with B vitamins and tocopherol. Diet BB had the same fat content, but was deficient in protein and choline, containing only 0.5 per cent. casein. Diet BC was like diet BB, but with choline added at 50 mg. per 100 g. Diet TT contained, per cent., minced turnips 81.5, wheat starch 7.0, groundnut oil 3.5, cod liver oil 4, salt mixture 4, and B vitamins; it was low in

energy and protein, but contained 75.6 mg. choline per 100 g. All were given to appetite.

All the protein-deficient diets produced loss of appetite and weight, and plasma protein levels fell. Fat accumulated rapidly in the livers of mice on diet BB and there was a transient increase on diets BC and TT, not statistically significant after 9 days. The diuretic response to administration of water was greatly decreased in animals on diet BB after 7 days, when fatty changes were greatest, and even more impaired after 10 days, though fatty changes were then less pronounced. There was some decrease in diuretic response on diets BC and TT; thus response was not related to degree of fatty change.—D. Duncan.

2038

BENDER, A. E., MILLER, D. S., TUNNAH, E. J. and BLACK, W. A. P. **Biological value of algal proteins.** *Chem. and Indust.*, 1953, No. 50, 1340-1341. [Crookes Laboratories, Ltd., Park Royal, London.]

Samples of *Rhodymenia palmata*, *Laminaria cloustoni*, *Ascophyllum nodosum* and *Pelvetia canaliculata* were dried at 40° to 60° C. for 6 to 8 hr. and milled to pass a 64-mesh screen. The dried milled seaweeds contained, in the above order, 23.5, 6.4, 8.8 and 12.7 per cent. protein.

Net protein utilisation (NPU) by rats was estimated by the method of Bender and Miller (Title 2726, Vol. 23). Difficulty was experienced in inducing the animals to eat some of the samples, and several treatments designed to increase palatability are described. *R. palmata* appeared to be the only useful source of protein and had an NPU of 42. It may find a use as a feed for animals if the mechanical difficulties of collecting it separately can be overcome.—P. C. Jowsey.

2039

MONDER, C. and RAMSTAD, P. E. **The effect of ball-milling upon certain properties of proteins.** *Arch. Biochem. Biophys.*, 1953, **46**, 376-384. [Sch. Nutrit., Cornell Univ., Ithaca, N.Y.]

During ball-milling of egg albumin, solubility was lowest and titratable sulphydryl groups were highest after about 600 hr.; solubility rose slowly up to about 1800 hr. and then more rapidly. There was no change in the content of methionine, tyrosine or phenylalanine, and only slight changes in histidine and tryptophan as estimated microbiologically, but cystine decreased from 2.9 to 2.7 g. per 16 g. N. Formol titration showed an increase of 1.0×10^{17} carboxyl groups per mg. Digestibility by trypsin increased steadily through the whole period of milling and at the end of 2160 hr. was greater than that of heat-denatured uncoagulated albumin. These findings are thought

N.A. and R., April 1954

to show denaturation with oxidation and breaking of secondary linkages, together with some slight degradation, during the first 600 hr. of ball-milling, followed by more extensive splitting of primary bonds, formation of small soluble peptides and increased susceptibility to proteolytic attack.

When wool was treated similarly, solubility and titratable sulphhydryl groups increased throughout the 2064 hours' milling; all the amino-acids tested decreased in concentration after the first 800 hr. to about 60 or 70 per cent. of their initial values, except tryptophan, which decreased from 0.55 to 0.12 g. per 16 g. N. This destruction of amino-acids is attributed to the long, exposed wool keratin molecule, as compared with the close, compact albumin molecule. Formol titration showed an increase of 1.8×10^{17} carboxyl groups per mg. Digestibility by trypsin increased rapidly for the first 900 hr. of milling and thereafter very slowly.—C. Warner.

2040

DAS, D. P., MURTHY, H. B. N. and SWAMINATHAN, M. **Studies on the nutritive impairment of proteins heated with carbohydrates. 1. *In vitro* digestion studies.** *Bull. Central Food Technol. Res. Inst. Mysore*, 1953, **2**, 259–261.

Casein was autoclaved for 2 hr. at 15 lb. per sq. in. with glucose, sucrose, lactose or maltose with or without water or starch, before digestion *in vitro* by trypsin or pepsin. Digestion was slower after heating with sugars than under the other conditions investigated. With small amounts of glucose or lactose and different autoclaving conditions, 5 lb. per sq. in. for 30 min., no reduction in the rate of digestion was found.

The rates of digestion of the proteins of "khawa" prepared from skimmed milk powder or buffalo milk and cane sugar were only slightly lower than those for the original milk powder and milk.

D. Harvey.

2041

MURLIN, J. R., HAYES, A. D. and JOHNSON, K. (with COATES, H. and LATEGOLA, M.) **Correlation between the biological value of protein and the percentage of creatinine N in the urine.** *J. Nutrition*, 1953, **51**, 149–161. [Dept. Physiol., Sch. Med. Dent., Univ. Rochester, N.Y.]

Seven proteins, of biological values from less than 50 to approximately 100, were given to dogs as their main source of N; the diets were adjusted to maintain bodyweight. There was a high positive correlation between the biological value of the protein and average proportion of creatinine N in the urinary N, though the latter showed wide fluctuations between individual tests.—C. Warner.

2042

BLOCK, R. J., BOLLING, D., WEISS, K. W. and ZWEIG, G. **Studies on bovine whey proteins.**

1. Preparation of the ferric derivatives of whey proteins. *Arch. Biochem. Biophys.*, 1953, **47**, 88–98. [Biochem. Res. Labs., Special Products Div., Borden Company, Yonkers 3, N.Y.]

A number of compounds, designated ferrilactins, were prepared by the addition of FeCl_3 to whey. These iron-protein complexes were readily digested by pepsin and by trypsin and were shown by feeding experiments with rats to possess an activity comparable with that of FeSO_4 for the regeneration of Hb. There was no evidence of their being toxic to rats, and their protein efficiency was equal to that of lactalbumin or casein.

D. Harvey.

2043

HUISMAN, T. H. J. Enkele beschouwingen aangaande het bepalen der afzonderlijke aminozuren in het bloed. [Some observations on the estimation of single amino-acids in blood.] *Nederland. Tijdschr. Geneesk.*, 1953, **97**, 2732–2743. [Kinderclin., Acad. Ziekenhuis, Groningen.]

Methods of estimating amino-acids in blood are reviewed. The method preferred is that of Moore and Stein (Abst. 4469, Vol. 21), a chromatographic method with Dowex 50. Clinical studies of the levels of 22 amino-acids in the ultrafiltrate of plasma in 2 normal men, 1 control and 2 infants with scurvy and 1 control and an infant with refractory rickets are discussed. The loss of the amino-acids histidine, serine, glycine, lysine and threonine in rickets is caused by failure of renal tubular reabsorption; the level in blood is not raised. (See Abst. 2280, Vol. 23.)—I. Leitch.

2044

ALMQUIST, H. J. **Principles of amino acid balance.** *Arch. Biochem. Biophys.*, 1953, **46**, 250–251. [Grange Co., Modesto, Calif.]

When a dietary protein is partly deficient in one essential amino-acid, the fraction which contains amino-acids in optimum proportions to the deficient amino-acid is the only part available for growth. Increasing the amount of the unbalanced protein will increase the amount of the balanced fraction and hence permit increased growth up to the natural limit of growth rate. Increasing the relative amount of the deficient amino-acid increases the proportion of the protein available for growth until the whole of the protein is so used or the natural limit is reached. If a slightly deficient protein is given at a high level so that maximum growth response is obtained, addition of the deficient amino-acid will increase the efficiency of utilisation of the feed.

The author illustrates these principles with previously published results.—C. Warner.

2045

WOMACK, M., MARSHALL, M. W. and PARKS, A. B. **Some factors affecting nitrogen balance in the adult rat.** *J. Nutrition*, 1953, **51**, 117-130. [Bur. Human Nutrit., Agric. Res. Admin., U.S. Dept. Agric., Washington, D.C.]

Diets containing the non-essential amino-acids at concentrations of 0.1 and the essential amino-acids at 0.1 or 0.2 per cent., ammonium citrate, carbohydrate, fats, salts and vitamins were given to male rats, with or without a previous period of 18 days on a similar but N-free diet. With sucrose as carbohydrate, increasing the average daily N intake of undepleted animals from 35.8 to 46.4 or 72.6 mg. by the addition of ammonium citrate caused small, statistically non-significant increases in the N balance from -23.2 to -19.4 or -17.2 mg. When the essential amino-acids were given at the higher level, providing a N intake of 47.7 mg., the N balance was significantly improved to -7.2 mg. In depleted rats N losses were less, but otherwise the results were similar.

When maize dextrin was substituted for sucrose, the rats were approximately in N equilibrium, and there was little or no effect of ammonium citrate, extra essential amino-acids or earlier depletion. Addition of 1 per cent. sulphasuccidine further improved N balance. Potato dextrin had a much smaller effect, not significant at the higher intake of essential amino-acids.—C. Warner.

2046

PEREIRA, M. D., CONRAD, E. J., and ELMAN, R. **The influence of inanition on the utilization of a low caloric-amino acid mixture given intravenously.** *Surgery*, 1953, **34**, 874-879. [Div. Surg. Metabol., Homer G. Phillips Hosp., St. Louis, Mo.]

A positive N balance was maintained in 13 extremely undernourished patients during intravenous administration for 3 days of an amino-acid and glucose mixture, providing a daily intake of 12.6 g. N and 400 to 800 non-protein Cal. The patients had lost on an average 65 per cent. of their normal weight and had been in negative N balance because of the anorexia of disease or mechanical inability to eat. The urinary N excretion during the days of infusion was similar in all the patients and in some was less than the output during the days preceding the infusion, when they were maintained on glucose alone. There was no correlation between N retention and weight loss, and no difference in N retention between patients receiving 400 and those receiving 800 Cal. from carbohydrate. Three of the patients were brought into a state of repletion by a good diet and the

amino-acid infusion was repeated; N retention was much less than before repletion and was negative in 2 of the 3 patients. It is concluded that the N balance on a low energy intake is related to the body protein stores and is a measure of the degree of protein depletion.—L. Wills.

2047

GOLDSTEIN, L. S. **The effect of supplementary dl-methionine on the growth of full term infants.** *Arch. Pediat.*, 1953, **70**, 285-293. [Dept. Paediat., Professional Hosp., Yonkers, N.Y.]

The infants were fed at home and received supplements of 90 mg. (50 infants), 180 mg. (20) or 360 mg. (10) methionine daily, 109 infants serving as controls. It is concluded that those receiving 180 mg. methionine did best and that those receiving 360 mg. showed impairment of growth.—F. C. Aitken.

2048

ABBASY, A. S. and EISA, E. A. **The excretion of methionine in children in health and disease with note on the value of methionine tolerance test as an index of liver function.** *J. Roy. Egypt. Med. Assoc.*, 1953, **36**, 265-280. [Univ. Alexandria.]

2049

PRICE, W. A. (Jr.), TAYLOR, M. W. and RUSSELL, W. C. **The retention of essential amino acids by the growing chick.** *J. Nutrition*, 1953, **51**, 413-422. [Dept. Agric. Biochem., New Jersey Agric. Exp. Stat., New Brunswick.]

Chicks were fed from 1 week of age on a mixture of soya bean meal 20, dried distiller's solubles 4, dried whey 4, fishmeal 4, meat scrap 3, alfalfa meal 3, minerals, vitamins and cereals and cereal offals to 100. After they had gained 160 g. they were slaughtered and the carcass contents of N and essential amino-acids were estimated and compared with those of similar birds killed at 1 week old.

It was estimated that 33 per cent. of the N in the feed had been retained. For individual amino-acids the retentions varied from 27 per cent. for tryptophan to 43 per cent. for lysine, although the lysine content of the ration was above the U.S. recommended allowance and that of tryptophan slightly below it. Of the essential amino-acid intake not recovered in the carcass less than one-third was found in the excreta.

Parallel trials were made with another ration containing only 16.5 per cent. crude protein, but with all the supplementary protein coming from animal by-products. With this ration 56 per cent. of the N was retained in the carcasses, with from

39 to 71 per cent. retention of individual amino-acids.

There was no significant difference between the amino-acid composition of the chicks receiving the different rations, although the second contained only 68 per cent. of the recommended allowance of arginine, and the first was deficient in methionine and tryptophan.—K. J. Carpenter.

2050

CRAMPTON, R. F. and SMYTH, D. H. **The excretion of the enantiomorphs of amino-acids.** *J. Physiol.*, 1953, **122**, 1-10. [Dept. Physiol., Univ. Sheffield.]

When racemic mixtures of alanine, histidine and methionine were injected intravenously into cats it was found that the D:L ratio was less than unity in the plasma, but more than unity in the urine. Clearance studies with alanine and methionine, using creatinine clearance to estimate glomerular filtration rate, showed that the L-isomers were actively reabsorbed by the tubules, with plasma threshold values of about 0.5 mg. per ml. for L-alanine and 1.3 mg. per ml. for L-methionine. With the D-isomers slight reabsorption occurred, presumably passive, and no threshold value was noted. The diffusion rates of D- and L-alanine were the same through cellophane or through rat intestine kept at 10° C. to abolish the mechanism for active transfer of L-amino-acids.

It is concluded that the reduced nutritional value of D-amino-acids is influenced by the failure of the kidney to retain them.—C. Warner.

2051

ESH, G. C. and SOM, J. M. **Nutritional survey of available food materials. 4. Availability of methionine, cystine and tryptophan in pulses.** *Indian J. Physiol. Allied Sci.*, 1953, **7**, 158-162. [Bengal Immunity Res. Inst., Calcutta.]

Bengal, green and black gram were relatively good and Khesari was a poor source of methionine; Bengal and black gram and Khesari were good and lentil was a poor source of cystine; all the pulses were good sources of tryptophan. The availability of methionine for rats was low in lentil and Khesari; that of cystine was low in red gram, dried peas and Khesari; that of tryptophan was low in red gram.—C. Warner.

2052

HARTSOOK, E. W. and JOHNSON, B. C. **Effects of dietary terramycin and methionine supplements on fat and protein gains in weanling rats.** *J. Nutrition*, 1953, **51**, 205-218. [Div. Animal Nutrit., Univ. Illinois, Urbana.]

Weanling rats were fed on diets containing a modified soya bean protein, in which cystine and methionine together formed 0.42 per cent. of the

diet, and the effects were studied of adding methionine, terramycin or both.

No significant effect was found when the methionine was increased to give a cystine plus methionine content of 0.81 per cent. Addition of terramycin resulted in slight increases in feed intake, carcass dry matter and feed efficiency, a marked increase in carcass ether extract and a slight decrease in N efficiency. The interaction of methionine and terramycin increased carcass N and N efficiency and decreased carcass ether extract. Thus when the diet was low in methionine the increase in weight due to terramycin was mainly ether extract, but when methionine was adequate the increase was mainly protein.

C. Warner.

2053

MACHLIN, L. J., PEARSON, P. B., DENTON, C. A. and BIRD, H. R. **The utilization of sulfate sulfur by the laying hen and its incorporation into cystine.** *J. Biol. Chem.*, 1953, **205**, 213-219. [Bur. Animal Indust., U.S. Dept. Agric., Beltsville, Md.]

Laying hens were given ³⁵S as sulphate by mouth or vein. Radio-active S was found in the white and yolk of the eggs laid, the peak concentrations occurring 3 or 4 days after administration. The method of administration made little difference to the quantities present in the eggs. About 35 per cent. of the ³⁵S in the eggs was non-sulphate or "organic" S; a higher proportion of this was in the white than in the yolk. Cystine was labelled, but not methionine.—R. Hill.

2054

JACKSON, H. D., MERTZ, E. T. and BEESON, W. M. **Quantitative valine requirement of the weanling pig.** *J. Nutrition*, 1953, **51**, 109-116. [Dept. Agric. Chem., Purdue Univ., Lafayette, Ind.]

Weanling pigs received diets of equal crude protein content, 12.8 per cent., based on maize with supplements of crystalline essential amino-acids and ammonium citrate, minerals, liver extract and cerelese. The amounts of the amino-acids given were such as to bring the total available up to the minimum required for good growth where this was known, or were based on experience with rats. It was assumed that the digestibility of the constituent amino-acids was the same as that of the maize protein and that the D-isomers of lysine, threonine and valine were physiologically inactive and those of phenylalanine, methionine and tryptophan active.

Weight gain, feed consumption and feed efficiency were all lower when the available L-valine content of the diet was 0.3 than when it was 0.4, 0.5, 0.6 or 0.7 per cent., these 4 levels giving similar results. It is concluded that the L-valine requirement of the weanling pig is 0.4 per cent.

of the diet or 3.6 per cent. of the digestible crude protein.—C. Warner.

2055

LANG, K. and OSTER, H. Untersuchungen über den Stoffwechsel der γ -Aminobuttersäure und der α -Aminoisobuttersäure. [Metabolism of γ -aminobutyric acid and α -aminoisobutyric acid.] *Biochem. Ztschr.*, 1953, **324**, 443–446. [Physiol. Chem. Inst., Johannes Gutenberg Univ., Mainz.]

γ -Aminobutyric acid and α -aminoisobutyric acid given to young rats in amounts of 50 mg. per head daily did not change the rate of growth in a 3 weeks' test. With intraperitoneal injection the lethal dose for the mouse was about 10 mg. of γ -aminobutyric acid per g. bodyweight and slightly more of α -aminoisobutyric acid. Homogenates of liver, kidney and brain oxidised both amino-acids to a small extent, but muscle tissue was ineffective. After injection of 100 to 500 mg., rats excreted both acids quantitatively in the urine, and at the same time excretion of other amino-acids increased considerably, as shown by paper chromatography.

M. B. Richards.

2056

SCHÜLTZ, G. O. Geht die L-Glutaminsäure im Tierkörper über die L-Pyrrolidonecarbonsäure in L-Prolin über? [Is L-glutamic acid in the animal body converted to L-proline by way of L-pyrrolidone carboxylic acid?] *Biochem. Ztschr.*, 1953, **324**, 295–300. [Diagnost. Inst., Freiburg i. Br.]

No proof has been given of the textbook assertion that proline is formed in the animal body from glutamic acid, with pyrrolidone carboxylic acid as an intermediate product. All attempts by the author to reduce this amino-acid to proline *in vitro*, whether by chemical or biological means, resulted in failure. Its behaviour in metabolism was investigated by means of experiments on rabbits. In feeding tests only 2 per cent. of the ingested pyrrolidone carboxylic acid was recovered from the urine, but after parenteral administration 92 to 94 per cent. was excreted. The explanation given of this difference in retention is that L-pyrrolidone carboxylic acid given by mouth is hydrolysed in the pH range of the gastric juice to L-glutamic acid, any unhydrolysed excess being excreted through the bile. A large part of the glutamic acid formed from the amino-acid is utilised in intermediary metabolism, but proline formation does not take place. This was shown by the injection experiments, in which the pyrrolidone carboxylic acid was excreted through the urine as a foreign body. L-Pyrrolidone carboxylic acid resists biological reduction systems in the body just as completely as it does all attempts at reduction *in vitro*.—M. B. Richards.

2057

NASSET, E. S. and ELY, M. T. Nitrogen balance of adult rats fed amino acid diets low in L-, DL- and D-tryptophan. *J. Nutrition*, 1953, **51**, 449–461. [Dept. Physiol., Sch. Med. Dent., Univ. Rochester, N.Y.]

The technique and experimental diets were similar to those described by Nasset *et al.* (Abst. 5099, Vol. 21), except that tryptophan instead of threonine intake was reduced. The natural isomer was given to 35 rats, DL-tryptophan to 30 and D-tryptophan to 26.

The requirement for maintenance of N equilibrium in the adult rat was estimated, in mg. per kg.^{0.75} bodyweight daily, as L-tryptophan 4.4 ± 0.22 , DL-tryptophan 6.0 ± 0.31 , or D-tryptophan 8.8 ± 0.57 .—D. Duncan.

2058

BAVETTA, L., BERNICK, S., GEIGER, E. and BERGREN, W. Effect of tryptophane deficiency upon the jaws of rats. *J. Dent. Res.*, 1953, **32**, 637. *Proc.* [Sch. Dent., Univ. S. California, Los Angeles.]

2059

WILLIAMS, M. A. and GRAU, C. R. Effects of variations in dietary energy on food intake and utilization of lysine-deficient protein. *Poultry Sci.*, 1953, **32**, 928. *Proc.* [Univ. California, Berkeley.]

2060

LANG, K. and BITZ, H. Über den Stoffwechsel der ϵ -Aminocaproinsäure. [Metabolism of ϵ -aminocaproic acid.] *Biochem. Ztschr.*, 1953, **324**, 495–498. [Physiol. Chem. Inst., Johannes Gutenberg Univ., Mainz.]

ϵ -Aminocaproic acid does not act as an antagonist to metabolism in rats. Its toxicity is slight, the lethal dose by intraperitoneal injection being about 2 g. for animals weighing from 140 to 170 g. A daily intake of 100 mg. for 7 weeks did not affect the growth of young rats. Homogenates of liver and kidney oxidised the acid to some extent; the enzyme involved is very unstable and is not contained in the cyclophorase system, and the oxidation is not a deamination. After injection of 500 mg. into rats, most of the acid was excreted unchanged in the urine, and at the same time the excretion of other amino-acids increased.

M. B. Richards.

2061

GUTMAN, A. B. Primary and secondary gout. *Ann. Int. Med.*, 1953, **39**, 1062–1076. [Dept. Med., Mount Sinai Hosp., New York.]

See also Absts. 1581, 1798, 1800, 1835, 1909, 2012, 2093, 2238, 2562.

N.A. and R., April 1954

FATS AND OTHER LIPIDS

2062

SHORLAND, F. B. **Animal fats : recent researches in the Fats Research Laboratory, D.S.I.R., New Zealand.** *J. Sci. Food Agric.*, 1953, **4**, 497-503. [Fats Res. Lab., D.S.I.R., Wellington, N.Z.]

2063

BEZNÁK, A. B. L. **Dietary fat, work and growth.** *Gegenwartsprobleme der Ernährungsforschung, Symposium, Basle*, October 1952, 230-235 (with discussion 236-238). Verlag Birkhäuser, Basle, 1953. Price Swiss fr. 32. [Dept. Physiol., Univ. Birmingham.]

2064

KLINC, L. Über die "scheinbare" und "wahre" Ausnutzung des Fettes der Cerealien und Leguminosen. ["Apparent" and "true" utilisation of the fat of cereals and legumes.] *Biochem. Ztschr.*, 1953, **324**, 385-396. [Inst. Ernährungsforsch., Serb. Akad. Wissensch., Belgrade.]

Values for "apparent" utilisation of the fat of cereals and legumes quoted in the literature and in the tables of König and Schall are considered misleading because of the different experimental methods and failure to take account of metabolic faecal fat. "True" utilisation as a percentage is defined as

$$\frac{NF - (KF - SF)}{NF} \times 100,$$

where NF is fat intake, KF total faecal fat and SF metabolic faecal fat. This is not to be confused with "true" digestibility, since the total faecal fat may include fat of dietary origin which has been digested but not absorbed. It is not feasible to correct for metabolic faecal fat by a single numerical factor for cereals differing in grain size and crude fibre content.

Six men and 3 women in good health, aged from 27 to 48 years, were subjects of 25 experiments. They had cereal or legume as sole food, apart from tea with sugar, for from 3 to 6 days, followed immediately by 3 to 5 days of the cereal or legume defatted with ether. This allowed estimation of SF. Maize was taken as polenta, millet (proso) as gruel, peasemeal, beanmeal and oat flakes as purée, and the others as bread. All except oat flakes and soya bean meal were tested on 2 subjects.

From the tabulated results it is clear that the values for "apparent" utilisation may be low or erratic and vary with the solvent used to extract the faeces, but the values for "true" utilisation are consistent and high, irrespective of the fat and crude fibre contents of the cereal or legume. The

mean "true" utilisation and "true" digestibility were as follows: wheat flour, 90 per cent. extraction, 90, 97; 70 per cent. extraction, 95, 96; rye flour, 75 per cent. extraction, 71, 88; barley meal 82, 86; oatmeal 92, 97; oat flakes 85, 93; maize meal 88, 93; millet (proso) 81, 95; buckwheat meal 79, 85; beanmeal 82, 91; lentil meal 82, 86; peasemeal 85, 88; soya bean meal 91, 95.

W. M. Deans.

2065

WADDELL, W. R., VAN ITALLIE, T. B., GEYER, R. P. and STARE, F. J. **Liver function during intravenous infusion of emulsified fat to humans.** *Ann. Surg.*, 1953, **138**, 734-740. [Dept. Nutrit., Harvard Sch. Pub. Health, Boston, Mass.]

Emulsions were prepared from 15 per cent. coconut or olive oil with 1 per cent. soya bean phosphatide and 1 per cent. polyglycerol ester of oleic acid as emulsifying agents. The 21 patients were all semi-starved and unable to eat, and 8 of them had major operations during the period of fat infusion. They received 500 or 1000 ml. infusions at a time.

Bromosulphalein retention and cephalin flocculation tests showed no change attributable to fat administration, but indicated the effects of the diseases or of surgery and anaesthesia. No consistent change was observed in serum alkaline phosphatase, serum protein, bilirubin, cholesterol and cholesterol esters, or prothrombin time. It is concluded that fat administration had no adverse effect on liver function.—D. Duncan.

2066

MENG, H. C. and YOUNG, J. B. (with CAIN, W. B. and GRIMES, D. M.) **The indispensability of fat in parenteral alimentation in dogs.** *J. Clin. Nutrit.*, 1953, **1**, 372-383. [Dept. Physiol., Sch. Med., Vanderbilt Univ., Nashville, Tenn.] Spanish summary.

With a technique and diet previously described (Abst. 783, Vol. 20) one dog was maintained for 4 weeks on complete parenteral feeding, receiving 80 Cal. per kg. bodyweight daily, of which 34 per cent. came from fat, 16 from protein and 50 from carbohydrate. It remained healthy and lively and gained 7.6 per cent. of its initial weight. Two other dogs were given the same treatment except that the fat was replaced by an isocaloric amount of glucose and in addition 100 mg. methyl linoleate, 100 mg. methyl linolenate and 10 mg. methyl arachidonate were given daily per kg. bodyweight. They lost 9.2 and 4.3 per cent. of their initial weight, were not alert and lacked a sense of well-being. Two dogs had the fat replaced by glucose, but did not receive fatty acids. They lost 9.1

and 6.2 per cent. of their initial weight, appeared emaciated and apathetic and developed lesions considered characteristic of essential fatty acid deficiency.

Laboratory tests made during the trial and a histological examination after death did not reveal any abnormality attributed to the feeding.

W. Godden.

2067

WADDELL, W. R., GEYER, R. P., CLARKE, E. and STARE, F. J. **Role of various organs in the removal of emulsified fat from the blood stream.** *Amer. J. Physiol.*, 1953, **175**, 299-302. [Dept. Nutrit., Harvard Sch. Pub. Health, Boston, Mass.]

The effects of evisceration and of removal of the liver, spleen, kidney, intestine or adrenals on the clearance of fat from the blood were studied in rats. An emulsion containing 25 per cent. coconut oil and 3 per cent. cerebroside was given intravenously.

Evisceration impaired fat clearance so that in the first hour after injection only 15 per cent. of the fat was removed from the blood, compared with 61 per cent. in normal rats. When two-thirds of the liver was removed fat clearance in the first hour was 35 per cent., but there was a considerable accumulation of fat in the remaining liver tissue, and this was thought to indicate that the remaining tissue was compensating by removing more fat than the corresponding amount of tissue did normally. When fat emulsion was given 1 hr. after removal of the spleen, 43 per cent. was cleared in the first hour, but by the following day clearance was normal. Removal of the kidneys did not affect fat clearance until the animals had become uraemic; the effect might then be a secondary one involving the liver. Removal of the intestine from the pylorus to the lower rectum only slightly delayed fat clearance, probably because of reduced portal blood flow. Adrenal removal was without significant effect. The liver and spleen are thus considered to exert the greatest influence on the rate of fat clearance.—D. Duncan.

2068

FAVARGAR, P. and GERLACH, J. **Variations dans le mode de résorption des différentes graisses et acides gras chez le rat. [Variations in method of absorption of different fats and fatty acids by the rat.]** *Helv. physiol. pharm. Acta*, 1953, **11**, 239-250. [Inst. Chim. Physiol., Univ. Geneva.]

Mixtures of fats and fatty acids were given to fasting rats: the free acids included elaidic acid and palmitic, stearic and oleic acids labelled with deuterium; some of the labelled acids were also incorporated individually into triglycerides. Three hours after receiving the lipid mixture the animals

were killed and the intestines were removed and cut into 3 portions. Free fatty acids, glyceride and phospholipin fatty acids were separately isolated from each portion and their deuterium content was estimated.

The partition of labelled fatty acids between the different lipid classes varied not only with the nature of the fatty acid, but more with the composition of the mixture. The differences were less in the composition of the phospholipins than in the glycerides.—G. A. Garton.

2069

BOSE, S. M. and SUBRAHMANYAN, V. **Influence of dietary fats on the fatty acids composition of body-fat of albino-rats.** *Ann. Biochem. Exp. Med.*, 1951, **11**, 207-218. [Central Food Technol. Res. Inst., Mysore.]

Weanling albino rats were fed for 4 weeks on an almost fat-free diet composed of maize starch 65, extracted casein 15, sucrose 10, yeast 5 and salt mixture 5 per cent. The 64 litters were then equally divided into 4 groups; the first group were fed on the above fat-free diet for another 12 weeks. The other three groups were fed for 12 weeks on a diet containing maize starch 20, extracted casein 30, fat 30, sucrose 10, yeast 5 and salt mixture 5 per cent.; the fat consisted of cow ghee, refined groundnut oil or vanaspati (m.p. 37°C.) prepared from the groundnut oil. All diets were supplemented with vitamins A, D and E. Total body fat (excluding liver and alimentary tract) was then extracted from the minced carcasses with ethanol and ether and the combined fats from the animals of each group were analysed for component fatty acids by standard ester-fractionation technique.

The major component acids of the fat of rats on fat-free diet were oleic, palmitic and hexadecenoic acids, with smaller amounts of stearic, myristic and linoleic and traces of arachidic and arachidonic acids. The feeding of groundnut oil substantially raised the content of linoleic acid in the body fat and slightly increased the arachidonic acid content. The hexadecenoic acid content of the fat of all fat-supplemented groups was lower than that of the fat-free group. *iso*Oleic acid was identified in the fat of the group given vanaspati. The amounts of the saturated acids myristic, palmitic, stearic and arachidic were of the same order in the fat of all 4 groups. Lauric acid was found only in the fat of the group fed on cow ghee.—G. A. Garton.

2070

BOSE, S. M. and SUBRAHMANYAN, V. **Effect of a high-fat rice diet on the deposition and fatty acids composition of liver-fat of albino-rats.** *Ann. Biochem. Exp. Med.*, 1952, **12**, 93-102. [Central Food Technol. Res. Inst., Mysore.]

N.A. and R., April 1954

About 1000 weanling albino rats were fed for 4 weeks on a poor South Indian diet and then for a further 4 weeks on the same diet supplemented with 30 per cent. cow ghee. The livers were then removed and the fat was extracted. The component fatty acids of the liver fat and the ghee were estimated by the ester fractionation technique.

Although the ghee contained about 20 per cent. of lower fatty acids, from butyric to capric, these were not deposited in the liver fat of the rats. The major component acids of the liver fat were palmitic and oleic acids; smaller amounts of myristic, stearic, hexadecenoic, linoleic and arachidonic acid were found, together with traces of lauric, arachidic and tetradecenoic acid.—G. A. Garton.

2071

BOSE, S. M. and SUBRAHMANYAN, V. **Component fatty acids of the liver-fat of albino-rats receiving a high-fat rice diet.** *Bull. Central Food Technol. Res. Inst. Mysore*, 1953, **2**, 236-237. [Div. Biochem. Nutrit.]

See above Abst.

2072

KAUNITZ, H. Studien über die Ernährung von Ratten mit hochoxydierten Fetten. [**Feeding rats with highly oxidised fats.**] *Arch. exp. Pathol. Pharmacol.*, 1953, **220**, 16-25. [Dept. Pathol., Columbia Univ., New York.]

Addition of highly oxidised lard to the diet of rats caused only mild changes if the animals were given all the known vitamins as separate suspensions. The severe disturbances reported by many workers from the use of highly oxidised fats may have been due to secondary deficiency diseases caused by rapid destruction of the vitamins of the diet by the oxidised fat. In rats on a complete diet the one constant change observed on addition of oxidised fat was a diminution in weight. This was not due to lack of unsaturated fatty acids or to decreased food intake, and probably not to disturbance of fat absorption. The weight loss, which was roughly parallel to the degree of oxidation of the fat, could be reduced by increasing the protein content of the diet. This indicates that the active components of the oxidised fat could be reduced and thereby inactivated by protein. The weight-reducing effect of highly oxidised fats was more pronounced when they were added to a diet deficient in protein or riboflavin, and the deficiency in these circumstances was much more severe with oxidised than with fresh fat.—M. B. Richards.

2073

FINK, H. and SCHLIE, I. Eine neue Diät zur Erzeugung der alimentären Lebernekrose der Ratte (Champignon-Diät). [**A new diet for the production of alimentary liver necrosis in**

the rat. Mushroom diet.] *Naturwissenschaft-en*, 1953, **40**, 491. [Inst. Gärungswissenschaft, Univ. Cologne.]

The diet for production of liver necrosis in the rat consisted of mushrooms 25.6, wheat starch 62.7, liver oil 3.4, brewer's yeast 2, McCollum's or other salt mixture 4 and Ca phosphate 2.5 parts. Synthetic B vitamins may be used instead of the yeast. Cultivated mushrooms are cooked for 1 hr. with 100 ml. water to 9 kg. mushrooms and then minced. The other ingredients are added and the mixture is baked into biscuits in a drying oven at 70° C. This diet produced fatal liver necrosis in from 20 to 40 days in 95 per cent. of rats and was more reliable than the yeast diet previously used.

W. M. Deans.

2074

RUBINO, F. and SCAVO, R. Modificazioni istologiche delle isole di Langerhans nei ratti albini alimentati con dieta steatogena. [**Histological changes in the islets of Langerhans in albino rats given a diet to produce fatty liver.**] *Arch. Fisiol.*, 1953, **53**, 74-83. [Ist. Fisiol., Univ. Palermo.]

Histological examination was made of the pancreas of groups of 4 rats fed for 10, 15, 20 or 25 days on a diet containing, per cent., sucrose 48, fat 40, casein 5, agar 2 and salts 5, with adequate vitamins. Comparison was made with rats on a normal diet. As the period on the diet increased, the cells in the islet tissue lost their arrangement in rows, and there was atrophy and disappearance of basophil cells. After 25 days the islets were shrunken, with atrophy of almost all their cells.

E. M. Hume.

2075

BERNHARD, K. Leberverfettung verhindernde Faktoren der Nahrung. [**Components of food inhibiting fatty liver.**] *Gegenwartspunkte der Ernährungsforschung, Symposium, Basle*, October 1952, 116-122 (with discussion 123-124). Verlag Birkhäuser, Basle, 1953. Price Swiss fr. 32. [Physiol. Chem. Inst., Univ. Basle.]

2076

THOMASSON, H. J. **Biological standardization of essential fatty acids (a new method).** *Internat. Ztschr. Vitaminforsch.*, 1953, **25**, 62-82. [Unilever Res. Lab., Zwijndrecht, The Netherlands.] German and French summaries.

Male albino rats were used in groups of 12, aged 21 days at the beginning of the experiment and weighing about 40 g. They were fed for 9 weeks on a diet with or without hardened coconut oil, but containing no essential fatty acid, and were given free access to water for 2 weeks. For the last 7 weeks the animals were caged individually and the water intake was limited to 14 ml. daily.

The rats each received 0.2 ml. of fat or fatty acids or of a mixture of hardened coconut oil with fat or fatty acid for 5 days weekly from the sixth to the ninth week inclusive. The weight gain produced by 10 mg. linoleic acid was taken as the unit of biological activity. The potency of the test substance was calculated by the method of Irwin (*J. Roy. Statist. Soc. Suppl.*, 1937, 4, 1).

The results of a large number of assays showed that biological activity was correlated mainly with the conjugable diene content of the fatty acid as estimated spectrophotometrically. The most potent acid found was arachidonic acid, its potency being about one-third as great again as that of linoleic acid or that of $\Delta^{6,9,12}$ -octadecatrienoic acid (γ -linolenic acid) obtained from the seed fat of *Oenothera biennis*. A much smaller response was given by $\Delta^{10,13}$ -nonadecadienoic acid and $\Delta^{9,12,15}$ -octadecatrienoic acid (linolenic acid). It appears likely that arachidonic acid is the active form of essential fatty acid in the animal body.

G. A. Garton.

2077

BERNHARD, K. and GLOOR, U. Einige weitere, im Sinne des sogenannten Vitamine F wirk-same Fettsäuren. [Some other fatty acids with the effect of the so-called vitamin F.] *Helv. physiol. pharm. Acta*, 1953, 11, 323-328. [Physiol. Chem. Inst., Univ. Basle.]

In repetition of the work of Guggenheim and Jürgens (Abst. 370, Vol. 17), in which a diet free of essential fatty acids, given to rats during the last half of pregnancy and during lactation, resulted in high mortality rate and poor growth in the young, it was found that the addition of stearic, 19:10-dihydroxystearic or 9:1 diketostearic acid to the mother's diet improved the growth rate and life expectancy of the young. The possible conversion of these acids into linoleic acid is discussed.—W. Godden.

2078

ROKKONES, T. A dietary factor essential for hair growth in rats. *Internat. Ztschr. Vitaminforsch.*, 1953, 25, 86-98. [Biochem. Inst., Vet. Coll. Norway, Oslo.] German and French summaries.

The percentage composition of the fat-deficient basal diet was sucrose 63, petroleum-extracted dried codfish meal 25, petroleum-extracted dried brewer's yeast 5, NaCl 1, CaCO₃ 1, salt mixture 5. Albino rats received this diet with weekly doses of vitamins A and D dissolved in ethanol and vitamin K in water. Growth of hair after clipping was studied.

The syndrome of higher unsaturated fatty acid deficiency as described by Burr (*J. Biol. Chem.*, 1929, 83, 345) was seen, with scale formation on the legs after 3 or 4 weeks in winter; in summer

scale formation was slight. Addition of 0.12 to 0.2 g. linseed oil daily to the diet increased the rate of hair growth, and fatty acids prepared from linseed oil and given subcutaneously were also effective. Linolenic or linoleic acid given by mouth as the methyl ester was as effective as the oil; 30 mg. linoleic acid daily produced better hair growth than 24 mg. linseed oil.—D. Duncan.

2079

RODRÍGUEZ, R. R., CATTÁNEO, P., HOUSSAY, B. A. and UNO, B. Unsaturated fatty acids and alloxan diabetes. *J. Nutrition*, 1953, 51, 441-448. [Inst. Biol. Med. Exp., Buenos Aires, Argentina.]

Groups of male rats were fed to appetite for 1 month on high-carbohydrate or high-fat diets. The latter contained the same percentage of coconut oil, lard, olive oil, maize oil, sunflower oil, linseed oil, oleic acid, a mixture of palmitic and stearic acids or a mixture of caprylic and capric acids. The animals then received an injection of alloxan intraperitoneally or intravenously; mortality was recorded for the following 10 days. The survivors were fasted for 7 hr. before blood sugar was estimated.

The toxic and diabetogenic effects of alloxan were prevented in rats which received a high-fat diet, the fat of which consisted primarily of saturated fatty acids; diets rich in unsaturated fatty acids did not protect.—G. A. Garton.

2080

THOMAS, K. Fütterungsversuche mit synthetischen Fettsäuren. [Feeding experiments with synthetic fatty acids.] *Gegenwartprobleme der Ernährungsforschung, Symposium, Basle*, October 1952, 125-142 (with discussion 143-147). Verlag Birkhäuser, Basle, 1953. Price Swiss fr. 32. [Med. Forschungsanst., Max-Planck-Gesellsch., Göttingen.]

2081

HOBSON, W., JORDAN, A. and ROSEMAN, C. Serum-cholesterol levels in elderly people living at home. *Lancet*, 1953, 265, 961-964. [Dept. Social Indust. Med., Univ. Sheffield.]

Samples of blood were obtained from 98 men aged from 66 to 85 years and from 141 women aged from 61 to 87 years; 36 men and 34 women students between 18 and 29 years of age were control subjects. Food consumption was recorded by 71 men and 84 women for a week.

The range of serum cholesterol values was for men 176 to 409 mg. and for women 200 to 481 mg. per 100 ml. In both sexes the means for the older subjects, men 268 and women 310, were greater than for the younger, men 211 and women 233 mg. per 100 ml. For both age groups the

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mean was significantly higher in women than in men. Heavy drinkers, of whom there were 12 among the men, had, on the average, lower levels than had lifelong teetotallers. Correlation of serum cholesterol with intake of fat or with thickness of an abdominal skinfold was significant for women, but not for men. No correlation could be established between serum cholesterol and presence of conditions possibly associated with atherosclerosis, or between it and eye changes associated with ageing.—D. Harvey.

2082

THIELE, O. W. Die Acetalphosphatide des Blutserums bei alimentärer Lipämie. [The acetalphosphatides of blood serum during alimentary lipaemia.] *Ztschr. ges. exp. Med.*, 1953, **121**, 246-253. [Med. Klin., Justus-Liebig-Hochsch., Giessen.]

In healthy subjects after a meal of 50 ml. olive oil there was a significant increase in serum phosphatides and total lipids, but not in serum cholesterol. The average acetalphosphatide content remained unaltered, although there was a distinct decrease in some. This decrease was probably connected, not with the fat meal, but with the amount of blood withdrawn. The olive oil contained only very small amounts of acetalphosphatides.—M. B. Richards.

2083

WALKER, W. J. Relationship of adiposity to serum cholesterol and lipoprotein levels and their modification by dietary means. *Ann. Int. Med.*, 1953, **39**, 705-716. [Peter Bent Brigham Hosp., Boston, Mass.]

See Abst. 607, Vol. 24.

2084

OLIVER, M. F. and BOYD, G. S. The plasma lipids in coronary artery disease. *Brit. Heart J.*, 1953, **15**, 387-392. [Dept. Cardiol., Royal Infirmary, Edinburgh.]

Plasma lipids were estimated in a group of 200 subjects for whom there was cardiographic evidence of coronary artery disease, and in a group of 200 in-patients who were similar in mean age and age distribution but without signs of artery disease. There were 149 men and 51 women in the artery disease group and data are presented for 5 decades of age from 30 years upwards.

Men, but not women, in the youngest age group with the disease showed a mean level above normal for total cholesterol. For both sexes those with the disease also gave mean values for total cholesterol and for its ratio to phospholipins which were significantly above the levels for the control group at all ages, with one exception; at 50 to 59 years the values for the 2 groups of women were similar

because of a rise which occurred in each value at that time in women in the control group. The elevation, however, was true only for the age groups as such; individual values within them overlapped on occasion.

The possible existence of a hormonal basis for the rise in plasma lipids in the control group in the sixth decade is discussed.—D. Harvey.

2085

FRIEDMAN, M., BYERS, S. O. and SHIBATA, E. Observations concerning the production and excretion of cholesterol in mammals. 10. Factors affecting the absorption and fate of ingested cholesterol. *J. Exp. Med.*, 1953, **98**, 107-117. [Harold Brunn Inst., Mount Zion Hosp., San Francisco, Calif.]

The intestinal absorption of cholesterol was studied in groups of male rats, some of which had cannulae to divert bile from the intestine. Cholesterol was given by mouth, with and without Na cholate. Faeces were collected for 72 hr., after which the animals were killed. The faeces and intestinal contents were analysed for total sterols, cholesterol and "non-cholesterol sterols".

In a similar experiments intestinal lymph was collected from the abdominal portion of the thoracic duct and its cholesterol content was estimated; in some experiments cholesterol was estimated also in blood, liver and other tissues.

Analysis of faeces indicated greater absorption of cholesterol than did lymph analysis; the two methods of estimation agreed within about 20 per cent. In the intact rat the extent of cholesterol absorption is inversely proportional to the intake; faeces analysis showed that about 47 per cent. of a 50 mg. dose was absorbed, but only about 34 per cent. of a 100 mg. dose. The absorbed cholesterol was found mainly in the liver. Though bile is necessary for normal absorption of cholesterol, small amounts were found to be absorbed in its absence. Excess cholate intake increased the absorption of cholesterol by normal rats. The studies indicated that about 14 mg. cholesterol is daily excreted into the intestine of the rat and that part of it is re-absorbed.—G. A. Garton.

2086

BOYD, G. S. The possible role of coenzyme A in the biosynthesis of cholesterol in the rat. *Biochem. J.*, 1953, **55**, 892-895. [Dept. Biochem., Univ. Edinburgh.]

Two groups of rats were fed for 40 days on a diet containing 10.5 per cent. of neutral fat (olive oil), with or without Ca pantothenate; 2 other groups were fed for the same time on an isocaloric fat-deficient diet, with or without pantothenate. At the end of the experiment the animals were anaesthetised and bled from the carotid artery.

Total and free cholesterol were estimated in plasma and liver. Co-enzyme A was estimated in aqueous extracts of liver.

The concentrations of ester cholesterol in liver and plasma appeared to depend on dietary pantothenate, and hence on the content of co-enzyme A in the tissues, only in rats fed on the fat-deficient diet. The results are discussed in relation to the role of acetate in cholesterol and fatty acid metabolism, and it is suggested that the formation of ester cholesterol is dependent on co-enzyme A.

G. A. Garton.

2087

SCHOTZ, M. C., RICE, L. I. and ALFIN-SLATER, R. B. **Further studies on cholesterol in liver cell fractions of normal and cholesterol-fed rats.** *J. Biol. Chem.*, 1953, **204**, 19-26. [Dept. Biochem. Nutrit., Sch. Med., Univ. S. California, Los Angeles.]

The livers were removed from rats which had been fed on stock diet and from rats fed on a synthetic diet containing 0.5 per cent. of bile salt for 5 days and then supplemented with 1.0 per cent. cholesterol for 7 days. Liver homogenates were separated into 5 ultracentrifuge fractions designated nuclear, mitochondrial, submicroscopic particulate, floating and supernatant. Free and esterified cholesterol were estimated in each fraction.

In normal liver more than 60 per cent. of the free cholesterol was found in the submicroscopic particles, and most of the esterified sterol was associated with the floating (centripetally migrating) fraction. After 7 days of cholesterol feeding an increase was found in esterified cholesterol in the centripetally migrating fraction; small increases occurred also in the other cellular fractions.—G. A. Garton.

2088

MANN, G. V., ANDRUS, S. B., McNALLY, A. and STARE, F. J. **Experimental atherosclerosis in Cebus monkeys.** *J. Exp. Med.*, 1953, **98**, 195-218. [Dept. Nutrit., Harvard Sch. Pub. Health, Boston.]

The basal diet contained, per cent., casein 25, sucrose 60.3, salt mixture 4, maize oil 8, cod liver oil 2, choline chloride 0.5, *p*-aminobenzoic acid 0.1 and inositol 0.1. It was modified by reducing the casein to 10 per cent., replacing casein with 10 or 20 per cent. soya bean α -protein low in methionine, increasing the maize oil to 15 per cent., and adding 5 per cent. cholesterol. These variations provided 8 diets.

The mean normal serum cholesterol in *Cebus* monkeys, established by 103 estimations on 69 animals, was 142 mg. per 100 ml., S.D. 51. On a diet low in methionine, containing 20 per cent.

α -protein, 15 per cent. fat and 5 per cent. cholesterol, serum cholesterol rose to 500 mg. per 100 ml. in the seventh week and remained high. Levels above 300 mg. per 100 ml. were also attained in 2 monkeys receiving 10 per cent. casein with high fat and cholesterol. A supplement of 1 g. DL-methionine daily prevented the rise in plasma cholesterol and the loss of weight which accompanied it. DL-Methionine or L-cystine reversed the increase in plasma cholesterol. The increase was facilitated by high fat intake and reduced by high protein intake. Of 9 monkeys which had serum cholesterol levels of 300 mg. per 100 ml. or more for 18 to 31 weeks, 8 were found to have aortic lesions, as had 3 of 8 animals with high blood cholesterol of less than 18 weeks. Gross lipid infiltration of visceral organs was not found.

D. Duncan.

2089

NELSON, D., IVY, A. C., ALTSCHUL, R. and WILLHEIM, R. **Effect of aureomycin on experimental arteriosclerosis and serum cholesterol levels.** *Arch. Pathol.*, 1953, **56**, 262-267. [Dept. Clin. Sci., Univ. Illinois.]

Groups of 5 rabbits were used in a 20-week experiment to study the effect of combining cholesterol feeding with oral administration of aureomycin. Raising the cholesterol intake from 0.5 to 1.0 per cent. increased the severity and extent of vascular and parenchymal lesions, the average scores for histological rating of the 2 groups being 2.4 and 5.0, respectively, on a rating scale of 1 to 9. Increasing the cholesterol intake significantly increased the cholesterol, total lipid and lipid P of the serum, and the cholesterol:phospholipin ratio. The amount of fat in the liver was also increased. Addition of 0.025 per cent. aureomycin to the diet at both levels of cholesterol intake produced further significant increases in all these indications of cholesterol toxicity, except in liver fat, which did not differ significantly from that of the rabbits given cholesterol without aureomycin. The scores for histological rating in the groups with aureomycin were 4.4 and 8.8, respectively, for intakes of 0.5 and 1.0 per cent. cholesterol. The action of aureomycin in increasing blood cholesterol is probably due to its modification of the intestinal flora.—M. B. Richards.

2090

ROSENMAN, R. H., BYERS, S. O. and FRIEDMAN, M. **Role of cholate in dietary-induced hypercholesteremia of rats and rabbits.** *Amer. J. Physiol.*, 1953, **175**, 307-309. [Harold Brunn Inst., Mount Zion Hosp., San Francisco, Calif.]

Groups of adult rats of Long Evans strain were fed on a stock diet to which was added 2 per cent.

cholesterol or 1 per cent. cholic acid or both, a control group receiving no supplement. Groups of 6-week-old rabbits were given a stock ration alone or with 2 per cent. cholesterol or 1 per cent. cholate, dissolved in heated vegetable oil. After 8 weeks the rats and rabbits were killed, their aortas were examined for arteriosclerosis and blood cholesterol, cholic acid and phospholipins were estimated.

A slight rise in plasma cholate was observed in all rats given excess cholesterol or cholic acid, and in animals given both there was a marked increase in plasma cholate, cholesterol and phospholipins. No evidence of arteriosclerosis was found. In the rabbits, extensive arteriosclerosis developed in the aortas of animals which had received cholesterol. A moderate rise of plasma cholesterol was found in rabbits given cholate and a marked rise in those given cholesterol. The plasma phospholipin level was considerably raised in the cholesterol-fed group. In neither rats nor rabbits was high blood cholesterol related to plasma cholate concentration.

G. A. Garton.

2091

NICHOLS, C. W. (Jr.), SIPERSTEIN, M. D. and CHAIKOFF, I. L. **Effect of dihydrocholesterol (cholestanol) administration on plasma cholesterol and atherosclerosis in the rabbit.** *Proc. Soc. Exp. Biol. Med.*, 1953, **83**, 756-758. [Dept. Physiol., Sch. Med., Univ. California, Berkeley.]

Rabbits in 4 groups were fed for 2 weeks on a stock diet supplemented with 5 per cent. Wesson oil to which was added 1 per cent. cholesterol or 2 per cent. dihydrocholesterol or the two sterols together. For the next 5 weeks the rabbits received the stock diet alone, and then for 9 weeks the same experimental diets. Plasma cholesterol was estimated at intervals during the experiment, at the conclusion of which the animals were killed and their aortas and livers were removed. The areas of arteriosclerotic plaques were measured, and total liver lipids were estimated.

Rabbits given the diet containing 1 per cent. cholesterol showed high blood cholesterol values, averaging 1041 mg. per 100 ml., and an average arteriosclerotic plaque area of 271 sq. mm. Cholesterol with dihydrocholesterol gave an average plasma cholesterol value of 120 mg. per 100 ml. and an average plaque area of 4.9 sq. mm., showing that dihydrocholesterol inhibited the effect of cholesterol. Plasma cholesterol was not affected when dihydrocholesterol was given alone, but a few animals in this group developed arteriosclerotic plaques.

The average values for liver lipids were 3.0 per cent. for rabbits not given sterol, 6.7 per cent. for those given cholesterol alone, 3.3 per cent. for

those given dihydrocholesterol and 4.6 per cent. for those given both sterols.—G. A. Garton.

2092

ZILVERSMIT, D. B. **The fate of intravenously administered egg yolk phospholipides in dogs.** *Arch. Biochem. Biophys.*, 1953, **46**, 261-265. [Div. Physiol., Univ. Tennessee, Memphis.]

2093

WIKRAMANAYAKE, T. W., MUNRO, H. N., NAISMITH, D. J. and HUTCHISON, W. C. **A note on the influence of energy intake on phospholipid metabolism.** *Biochem. J.*, 1953, **55**, 640-644. [Dept. Biochem., Univ. Glasgow.]

In the first part of this investigation young adult rats were studied at different energy levels on diets with or without protein. The animals and the methods of liver lipid analysis were those described previously (Abst. 4579, Vol. 23).

The amount of liver phospholipin increased in response to increasing energy intake when the diet contained an adequate amount of protein, but not when the diet was protein-free.

In the second study rats with an initial body-weight of 180 g. were fed on diets of which the energy value was varied by altering the amount of carbohydrate, in presence or absence of protein. The animals received injections of 10 μ C. inorganic $^{32}\text{P}\text{O}_4$ per 100 g. bodyweight and were killed with ether 2, 5 or 8 hr. later. The livers were removed and the phospholipins were isolated for ^{32}P estimation and computation of the rate of phospholipin turnover.

The turnover rate was influenced by energy intake on diets containing protein. On protein-free diets the rate of phospholipin formation was not affected by energy intake within the range studied. It is suggested that some dietary substance other than protein was reduced to a level at which it became the limiting factor in phospholipin formation.—G. A. Garton.

2094

PITTONI, A. and ROSSI, C. R. **Sul meccanismo d'azione dei fattori lipotropi. 2. Il metabolismo dei corpi chetonici nel fegato di ratti trattati con lipocaico. [Mode of action of lipotropic substances. 2. Metabolism of ketone bodies in the liver of rats given lipocaic.]** *Arch. Sci. biol., Bologna*, 1953, **37**, 326-331. [Ist. Chim. Biol., Univ. Padua.]

For part 1 see Title 4762, Vol. 23.

In normal rats given 50 mg. lipocaic daily by mouth for 10 to 15 days there was a decrease in the amount of ketone bodies in the liver, and in

both the respiratory intensity and the R.Q. of the organ. Comparison of these data with those from experiments in which the animals were deprived of lipocaic by complete removal of the pancreas indicates that lipocaic acts in the liver by favour-

ing conversion of ketone bodies to glucose and inhibiting transformation of carbohydrate to lipids.

M. B. Richards.

See also Absts. 1897, 1913, 1961, 1979, 2004, 2032, 2171-73, 2174, 2194.

MINERALS

GENERAL

2095

CAUSERET, J. Les éléments minéraux dans l'alimentation de l'homme. [Mineral elements in human nutrition.] *Bull. Soc. sci. Hyg. aliment.*, 1953, **41**, 67-80. [Inst. Nat. Recherche Agrom.]

2096

TUDVAD, F., McNAMARA, H. and BARNETT, H. The excretion of bicarbonate and potassium in premature infants. *Acta paediat.*, 1953, **42**, 485. *Proc.*

2097

SAVCHUCK, W. B. Effects of strontium and fluoride on bone repair. *J. Dent. Res.*, 1953, **32**, 680-681. *Proc.* [Nat. Inst. Dent. Res., Staten Island, N.Y.]

2098

BERGMAN, E. N. and SELLERS, A. F. Studies on intravenous administration of calcium, potassium, and magnesium to dairy calves. 1. Some biochemical and general toxic effects. *Amer. J. Vet. Res.*, 1953, **14**, 520-529. [Dept. Vet. Med., Univ. Minnesota, St. Paul.]

Experiments were performed on 12 calves, ranging in weight from 48 to 240 lb. The jugular vein was cannulated with a polyethylene tube and injections were given from a constant infusion pump until severe signs of toxicity or death occurred.

The maximum dose of Ca tolerated was about 0.07 m. equiv. per kg. bodyweight per min. for 45 min. Death occurred at a total serum Ca level of 14 to 16 m. equiv. per litre, from cardiac failure with heart block and ventricular fibrillation. Development of signs was not progressive, but occurred in a series of crises.

Of 8 experiments with K, only one was fatal, death from cardiac failure following a slow increase in plasma K over 168 min. to 12.7 m. equiv. per litre. Development of signs was progressive, severe irritability, excitability and diuresis accompanying plasma K levels of about 8 m. equiv. per litre.

One of 5 experiments with Mg was fatal, death occurring from respiratory failure after injection at 0.14 m. equiv. per kg. per min. for 17 min. The rate of injection determined the severity of the

reaction and the total dose in the fatal experiment was only one-third that in non-fatal experiments. In the latter, light anaesthesia accompanied plasma levels of 10 to 13 m. equiv. per litre, with extreme cyanosis and dyspnoea. When Mg and Ca were given simultaneously ventricular fibrillation occurred, but the presence of Ca appeared to decrease the anaesthetic effect of Mg.

Na oxalate in 2 calves greatly depressed serum Ca and produced cyanosis and dyspnoea, but not death.

The interrelations of the blood electrolytes are discussed.—D. Duncan.

2099

FEDOROV, N. A., GRABETSKII, A. A., LISENKO, N. V., DAGAEVA, L. N., BOBOVSKII, E. V., ROZHANSKII, M. E. and PROKHONCHUKOV, A. A. Issledovanie mineral'nogo obmena v tverdykh tkanyakh zuba s pomoshchyu radioaktivnykh indikatorov. [Studies on mineral metabolism in the hard tissues of the tooth with the aid of radio-active tracers.] *Stomatologiya*, 1953, No. 1, 3-17.

Experiments in which ^{32}P , ^{45}Ca , ^{86}Sr , and ^{35}S were used as radio-active indicators showed that renewal of the components of the dental tissues, including the enamel, proceeds without interruption. During prolonged experiments on dogs the dynamics of P and Ca metabolism was studied in the solid tissues of the teeth and the time for maximum inclusion of these elements was estimated. P metabolism in the dental tissues of young dogs is much more intense than in grown dogs. Experiments on dogs with fistulae in the salivary duct of the parotid gland showed a regular uptake of P and Ca in the saliva after subcutaneous introduction of these elements. The enamel gets most of its inorganic elements from saliva, although the dentine canals play some part. Enamel of the lower teeth, being more in contact with saliva than the upper teeth, takes up more ^{32}P than the enamel of the upper teeth. Enamel of teeth which have been de-pulped and then filled retains its capacity to absorb the elements from saliva, but radio-activity cannot be detected in dentine. Enamel on teeth which have been shielded from saliva by metal caps exhibits little or no radio-activity. P was taken up more intensely in solid dental tissue during experimental vitamin B₁ deficiency than in control tests. Experiments on denervation of

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dental tissue showed the significance of nerve in the regulation of dental tissue. (From authors' summary.)—W. Hughes.

2100

NIZEL, A. E. and HARRIS, R. S. **Cariostatic effects of ashed foodstuffs fed in the diets of hamsters.** *J. Dent. Res.*, 1953, **32**, 672-673. *Proc.* [Tufts Dent. Sch., Boston, Mass.]

2101

SOGNNAES, R. F. and SHAW, J. H. **Experimental rat caries. 4. Effect of a natural ash mixture on the caries-conduciveness of an otherwise purified diet.** *J. Dent. Res.*, 1953, **32**, 685-686. *Proc.* [Harvard Sch. Dent. Med., Boston, Mass.]

See also Abst. 1580.

CALCIUM AND PHOSPHORUS

2102

FUQUA, M. E. and PATTON, M. B. **Effect of three levels of fat intake on calcium metabolism.** *J. Amer. Dietetic Assoc.*, 1953, **29**, 1010-1013. [Dept. Home Econ., Ohio Agric. Exp. Stat., Columbus.]

In 9 healthy young women Ca retention was not significantly different with fat intakes of 45, 91 and 135 g. Ca intake was approximately 600 mg. and the energy value of the diets was 2100 Cal. daily. Ca retention was not significantly correlated with B.M.R. The estimated average Ca requirement of the group was 630 mg. daily.

F. C. Aitken.

2103

CAUSERET, J. **Influence de la consommation d'eau sur l'élimination intestinale et rénale du calcium. [Effect of water consumption on calcium excretion by the intestine and kidney.]** *C.R. Acad. Sci.*, 1953, **237**, 664-665.

The percentage composition of the dry diet was : casein 18, arachis oil 9, starch 44, sucrose 24, salt mixture without CaCO_3 2, CaCO_3 1, agar 2, with added vitamins. It was given to 3 groups of young rats, but mixed with 500, 1300 or 2000 g. water to each kg. dry diet. Metabolic studies lasted for 10 days.

Urinary output of Ca increased with water intake from 3.8 mg. with the lowest intake to 7.2 and 11.9 mg. with the higher intakes, and faecal output was 263, 318.4 and 349.1 mg., respectively. Retention was 54, 45 and 40.6 per cent. of the total intake.—D. Duncan.

2104

LENGAR, N. G. C. and RAU, Y. V. S. **Green leafy vegetables as sources of calcium.** *Ann. Bio-*

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chem. Exp. Med., 1952, **12**, 41-52. [Military Food Lab., Poona.]

Data are presented for the contents of dry matter, total and water-soluble oxalates, total Ca and Ca remaining after water and acid extractions in 18 oven-dried samples of vegetables and 1 sample of betel leaves. A high content of Ca in a vegetable does not necessarily mean that the vegetable will be valuable as a source of Ca. Its value is likely to be high only if the ratio total Ca : total oxalic acid is greater than 1; if it is less than 0.2 the value will be poor. The value of betel leaf is attributable to CaCO_3 used in its preparation, not to its natural Ca content.

In growth experiments with rats the diets of 2 groups were basically similar and each contained 15 per cent. *Amaranthus polygamus*; they differed in that 62 per cent. of one was rice, of the other, maize starch. Growth and survival rates were better with rice than with maize starch, a finding which supports the view of Rau and Murty (Abst. 425, Vol. 13) that rice has a supplementary value in such diets.—D. Harvey.

2105

PATRICK, H. and SCHWEITZER, G. K. **Factors associated with bone mineralization—Ca⁴⁵ studies.** *Poultry Sci.*, 1953, **32**, 920. *Proc.* [Univ. Tennessee, Knoxville.]

2106

STEVENS, J. **The secretion of radio-active phosphorus in saliva and gastric juice in man.** *Clin. Sci.*, 1953, **12**, 375-383. [Dept. Surg., Univ. Glasgow.]

The subjects were men aged 45 or over, 8 of whom had duodenal ulcer, 4 gastric ulcer, 3 carcinoma of the stomach and 6 "non-gastric" complaints. After at least 5 hours' fasting the stomach was emptied and kept empty by continuous aspiration for 15 min. before ^{32}P injection and 3 hr. afterwards. ^{32}P was given by vein as orthophosphoric acid in normal saline, providing 100 μC . ^{32}P . Saliva was collected continuously and 4 blood samples were taken in the 3-hr. period.

In 8 out of 9 subjects the activity of the first saliva specimen, obtained 5 to 20 min. after injection, was greater than that of blood at that time. The ratio of salivary to blood concentration of ^{32}P varied within fairly narrow limits, the mean for 9 patients being 3.6. It was not correlated with rate of saliva collection.

In all the subjects ^{32}P appeared in the gastric juice within 5 min. and reached its highest concentration between 30 and 60 min. after injection. The maximum ratio of ^{32}P in gastric juice to ^{32}P in blood, also reached in the second half-hour, was low in subjects with high acidity and high in subjects with achlorhydria.

When saliva or gastric juice was treated with trichloroacetic acid the radio-activity was confined to the fluid.—D. Duncan.

2107

VAN BEKKUM, D. W. and QUERIDO, A. **Inorganic phosphate response to intravenous glucose administration in progressive muscular dystrophy.** *J. Clin. Invest.*, 1953, **32**, 1061–1064. [Dept. Dis. Metabol., Med. Clin., Univ. Hosp., Leyden.]

Ten normal subjects and 5 patients with progressive muscular dystrophy were instructed to ingest liberal amounts of carbohydrate for 3 days before the test, which was performed after a 12-hr. fast. Glucose and inorganic P were estimated in the blood before and 15, 30, 60, 90 and 120 min. after intravenous injection of 0.5 g. glucose per kg. bodyweight.

The mean glucose tolerance curve in dystrophic subjects was not significantly different from normal, though there was a delayed response in one subject. The mean maximum fall in plasma inorganic P, however, was only 10 per cent. in the dystrophic subjects, compared with 28 per cent. in controls, a highly significant difference.

D. Duncan.

2108

DE VENANZI, F. El fósforo total ácido-soluble de la sangre después de la administración de insulina. [Total acid-soluble phosphorus of blood after administration of insulin.] *Acta científ. venezol.*, 1953, **4**, 68–70. [Inst. Invest. Cientif., Caracas.] English summary.

2109

BHATTACHARYA, K. L., CHAKRABORTY, K. P., BOSE, A. and DAS GUPTA, N. N. **Comparative studies in the uptake of phosphorus by tissues under different doses of injected radioactive phosphorus P^{32} .** *Science*, 1953, **118**, 651–652. [Chittaranjan Cancer Hosp., Calcutta.]

2110

PLAICE, C. H. J. **Changes in phosphorus metabolism during inhibition or stimulation of growth by hormones.** *J. Endocrinol.*, 1953, **9**, xxxvii–xxxviii. [Dept. Biochem. Endocrinol. Res., Barrow Hosp., Barrow Gurney, Bristol.]

2111

CREMER, H. D., BÜTTNER, W., WEBER, H., DITTMANN, G. and HANNOVER, R. **Ernährungsfaktoren bei Zahn- und Knochenbildung. 3. Einlagerung von P^{32} in Zähne sowie in normalen und frakturierten Knochen bei ver-**

schiedener Mineralzufuhr. [Diet components in the formation of teeth and bones. 3. Deposition of ^{32}P in teeth and in normal and fractured bones after supply of different minerals.] *Biochem. Ztschr.*, 1953, **324**, 337–343. [Physiol. Chem. Inst., Univ. Mainz.]

For previous parts see Absts. 899, Vol. 22; 635, Vol. 24.

The radio-activity in bones and teeth after intraperitoneal injection of ^{32}P was studied in young rats from 17 to 21 days old and adult rats from 6 to 8 months old. This activity, a measure of the metabolic intensity of the organs, can be used to detect the presence of metabolic anomalies, such as tooth caries, and to measure the intensity of healing processes after fracture. Further experiments, with different diets and mineral supplements, indicated that measurement of the activity in fractured bones at a definite time after the fracture and parenteral administration of ^{32}P was a useful test of the effect of diet components.

M. B. Richards.

2112

PARK, E. A. and RICHTER, C. P. **Transverse lines in bone: the mechanism of their development.** *Bull. Johns Hopkins Hosp.*, 1953, **93**, 234–248. [Dept. Pathol., Sch. Med., Johns Hopkins Univ., Baltimore, Md.]

A study was made of the transverse line which frequently appears in bone after acute illness, and which is readily detectable on X-ray examination. The lesion was produced in young rats weighing from 130 to 150 g. by a diet of dextrose and vitamin B₁ chloride. After 58 days longitudinal bone growth had almost ceased and the animals had lost about 40 per cent. of their weight. Some rats were killed at this stage and their bones were examined, others were returned to stock diet and the bones were studied in recovery in animals killed at intervals.

The chief changes in the long bones of rats on the experimental diet were resorption of the trabeculae and a greatly narrowed proliferative cartilage plate encasing a thin layer of bone. This thin layer formed the transverse line. Centrally it was fragmentary, with gaps for capillaries, but at the sides it formed a solid encasement. The cause of its formation was the slowing or cessation of cartilage growth at an earlier stage than that of osteoblast activity.

When recovery began, osteoblasts settled on the bony film and began to produce osteoid, so that the line at first widened. Later, the cartilage cells re-established their cycle and osteoblasts and capillaries penetrated the cartilage and formed bone on the matrix frame. At this stage the transverse line ceased to widen, and it finally disappeared after some 25 days.—W. A. Greig.

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2113

DIStEFANO, V., NEUMAN, W. F. and ROUSER, G. **The isolation of a phosphate ester from calcifiable cartilage.** *Arch. Biochem. Biophys.*, 1953, **47**, 218-220. [Div. Pharmacol. Toxicol., Dept. Radiation Biol., Sch. Med. Dent., Univ. Rochester, N.Y.]

A compound has been found in hydrolysates of rachitic rat cartilage which appears to be a stable phosphate ester of a hexosamine which, in the cartilage, is bound to material insoluble in trichloroacetic acid. Incubation of the cartilage overnight in saline, which destroys its power of calcification, results in loss of the phosphate, but the presence of 1 per cent. CaCl_2 protects it.

A role of this phosphate in calcification is suggested.—D. Duncan.

2114

FREERKSEN, E. and MEISSNER, J. Über die Verteilung von radioaktivem Phosphat in gesunden und tuberkulösen Tieren. [Distribution of radio-active phosphorus in healthy and tuberculous animals.] *Ztschr. ges. exp. Med.*, 1953, **121**, 442-452. [Inst. Exp. Biol., Tuberkulose-Forschungs-Inst., Borstel, Bad Oldesloe.]

In extension of studies on healthy rabbits (Abst. 3255, Vol. 23), 10 rabbits with advanced tuberculosis were compared with 9 healthy ones. Distribution of ^{32}P differed significantly only in marrow and plasma, in which ^{32}P activity relative to that of whole blood was higher in the infected animals. That this was not a secondary change due to emaciation was shown by the fact that the values for 2 rabbits with hunger oedema were within the range for healthy rabbits. The lungs of the oedematous rabbits, however, showed high activity; the heavily diseased lungs of tuberculous rabbits showed about the same activity as those of the healthy.

Marrow activity relative to plasma activity was much the same in both healthy and tuberculous rabbits, but activity of other tissues and organs was less in the infected animals.

Decrease of phosphorylation of fat and carbohydrate with maintenance of nucleic acid formation is the explanation suggested for these findings.

W. M. Deans.

2115

McCLENDON, J. F. and GERSHON-COHEN, J. **The inhibitive effect of dietary phosphate fertilizer on dental carogenesis.** *J. Dent. Res.*, 1953, **32**, 668. *Proc.* [Albert Einstein Med. Centre, Northern Div., Philadelphia, Pa.]

See also Absts. 1577, 1734, 1735, 1944, 1945, 2177, 2179, 2194, 2222, 2554, 2615.

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MAGNESIUM

2116

YAMANE, G. M. and SINGER, L. **The effect of sub-minimal magnesium on the Syrian hamster.** *J. Dent. Res.*, 1953, **32**, 708-709. *Proc.* [Sch. Dent., Univ. Minnesota, Minneapolis.]

2117

VAN REEN, R. and PEARSON, P. B. **Magnesium deficiency in the duck.** *J. Nutrition*, 1953, **51**, 191-203. [McCollum-Pratt Inst., Johns Hopkins Univ., Baltimore, Md.]

Day-old ducklings received a diet of purified nutrients containing no Mg or up to 120 mg. Mg in 100 g. After 14 days they were killed and brain enzymes and riboflavin, nicotinic acid and free and bound pantothenic acid in liver were estimated.

Growth was retarded when the diet contained less than 50 mg. Mg. per 100 g. In Mg deficiency alkaline phosphatase and diphosphopyridine nucleotidase activities in brain tissue were low. The effect on phosphatase was greater and occurred earlier than that on nucleotidase. The vitamin B complex compounds estimated in the liver were not affected.—R. Hill.

SODIUM, POTASSIUM, AND SODIUM CHLORIDE

2118

SRIKANTIA, S. G., VENKATACHALAM, P. S. and GOPALAN, C. **Electrolyte studies in nutritional edema.** *Metabolism*, 1953, **2**, 521-528. [Nutrit. Res. Labs., Indian Council Med. Res., Coonoor, S. India.]

The subjects were Indians suffering from deficiencies of energy and protein. Blood Na was estimated in 30 on admission to hospital and in 12 of them after oedema had cleared; chloride was estimated in 19 and 11, and K in 8 and 7, respectively. Additional studies were made with 12 patients with oedema and on a diet containing 6.2 g. salt daily, of whom 6 were given 10 g. additional NaCl daily and 6 had 45 g. daily, in 3 doses, of Resodex, an NH_4K cation exchange resin which restricted Na absorption.

Serum Na was at the lower level of normal range when oedema was present and fell lower still when oedema cleared; chlorides were below normal both before and after, and K, which initially was at the upper level of normal range, showed a slight fall after oedema disappeared. High NaCl intake caused a temporary increase in retention of both water and salt, but when continued did no harm. Reduction of Na absorption produced polyuria, but this beneficial effect was also transient.

The low Na concentration in serum in these patients with nutritional oedema and the fact that

the oedema does not respond to treatment with resin suggest that retention of Na is not its cause.
D. Harvey.

2119

LEVIN, M. H., RIVO, J. B. and BASSETT, S. H. **Metabolic studies in gout with emphasis on the role of electrolytes in acute gouty arthritis.** *Amer. J. Med.*, 1953, **15**, 525-534. [Veterans Admin. Centre, Los Angeles, Calif.]

Records were made of balances of N, Na, Cl and K over 90 days in 1 patient and of Cl balance and uric acid excretion in another over 161 days and of Cl balance in a control subject over 59 days. During these periods adrenocorticotrophic hormone, testosterone, colchicine, pitressin and a mercury diuretic were administered separately to the patients and the control subject was given colchicine or the mercury diuretic. There was no evidence that "mineralocorticoid" activity of the adrenal cortex was related to the occurrence of acute attacks of gouty arthritis.—D. Harvey.

2120

FANCONI, G. and NEUHAUS, T. **Kalium und Tetanit. [Potassium and tetany.]** *Helv. paediat. Acta*, 1953, **8**, 424-450. [Kinderklinik, Univ. Zürich.] French, Italian and English summaries.

After reviewing the literature on the relationship between K and nervous excitability, the authors describe 13 cases which tend to confirm this relationship. In pseudo-uraemic eclampsia renal insufficiency causes retention of K in the extracellular fluid, and this retention can favour, or even cause, convulsions. Early spasmophilia, generally characterised by high phosphate, low Ca and high K in the serum, is probably due to transient or persistent parathyroid insufficiency and inability of the infant's kidneys to excrete excess phosphate. Excess of K, either absolute or relative to serum Ca, appears to favour the appearance of convulsions. In toxicosis the high serum K in the post-acidotic stage, especially after intravenous injection of K solutions, also may induce convulsions. In several older children with disturbance of the sympathetic nervous balance and tetany with normal serum Ca, a moderate increase was found in serum K.—M. B. Richards.

2121

KINSELL, L. W., BALCH, H. E. and MICHAELS, G. D. (with BILISOLY, J., BLOOMFIELD, N., FUKAYAMA, G., KIPP, E. and OLSON, F.) **Modification of "steroid diabetes" by potassium.** *Metabolism*, 1953, **2**, 421-423. [Inst. Metabol. Res., Highland Alameda County Hosp., Oakland, Calif.]

2122

FOURMAN, P. and ROBINSON, J. R. **Diminished urinary excretion of citrate during deficiencies of potassium in man.** *Lancet*, 1953, **265**, 656-657. [Med. Res. Council, Dept. Exp. Med., Univ. Cambridge.]

Total deficits of 300 and 450 m. equiv. K were induced in 2 normal men by ingestion of a low-K diet and a cation exchange resin. Their excretion of citrate was reduced from 160 and 380 mg. daily, respectively, to between 38 and 70 mg. Control values were not restored until the K deficit had been completely made good. There was no associated fall in plasma citrate.

A woman with renal acidosis, losing excessive amounts of K in urine, excreted from 4 to 74 mg. citrate daily and did not excrete more when she had been given 15 g. KCl daily for some time.

D. Duncan.

2123

MENEELY, G. R., TUCKER, R. G., DARBY, W. J. and AUERBACH, S. H. **Chronic sodium chloride toxicity: hypertension, renal and vascular lesions.** *Ann. Int. Med.*, 1953, **29**, 991-998. [Res. Lab., Thayer Veterans Admin. Hosp., Nashville, Tenn.]

See Absts. 3270, Vol. 23; 833, Vol. 24.

2124

TRUSCOE, R. and ZWEMER, R. L. **Plasma potassium curves in the rabbit, following single and repeated injections of potassium chloride.** *Amer. J. Physiol.*, 1953, **175**, 181-184. [Naval Med. Res. Inst., Nat. Naval Med. Centre, Bethesda, Md.]

2125

ROOT, M. A. **Comparison of the in vivo sodium-removing activity of various types of ion exchange resins in rats.** *J. Lab. Clin. Med.*, 1953, **42**, 430-437. [Lilly Res. Labs., Eli Lilly and Co., Indianapolis, Ind.]

Pairs of male Wistar rats received according to appetite a ground standard diet to which resins were added. Food, faeces and urine were analysed for Na, K, Cl and phosphate.

The standard resin was Amberlite XE-64. Amberlite XE-112 and XE-103 were about twice as effective as the standard for binding Na in the digestive tract. The 3 sulphonic acid resins were not more effective than the standard, and phosphonic acid resins were much less effective. Two liquid resins, given in the drinking water, were as effective as the standard on a dry-weight basis, but would be impractical clinically because of the large volume of fluid which would have to be used with them. The addition of the anion exchange resin Amberlite XE-58 did not increase the

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Na-binding capacity of Amberlite XE-64 and XE-88.

The amount of Na bound by 1 g. resin increased with increasing Na intake, but the percentage of ingested Na excreted in the faeces decreased; if low Na absorption is desired, the use of resins should therefore be accompanied by a low Na intake.—D. Duncan.

See also Abst. 2173.

HALOGENS

2126

GABOVICH, R. D. Eksperimental'noe issledovanie toksichnosti malykh kontsentratsii ftora. [An experimental investigation of the toxicity of small concentrations of fluorine.] *Gigiena Sanit.*, 1953, No. 1, 9-15. [Kaf. Obshch. Gig., Med. Inst., Kiev.]

Eight groups of rats were given F in drinking water in amounts varying from 0.01 to 40 or 50 mg. per kg. liveweight. Experiments continued over 9 months. With 0.11 to 0.29 mg. F per kg., faint striations were observed on some parts of the enamel of the incisors and there was accumulation of F in the tissues. With 0.44 mg. per kg. (i.e., 6 mg. per litre water, the highest concentration of F found in any reservoir in the U.S.S.R.), in addition to striations of the enamel there were slight biochemical changes and changes in enzyme activity and bone composition. With 1 mg. per kg. there were slight changes in the thyroid, kidneys and bones. With 3.75 to 11.3 mg. per kg. in addition to changes in the teeth there was a considerable decrease in enzyme activity, shown by changes in the internal organs and bones, and death from cachexia and pneumonia. At the rate of 40 to 50 mg. per kg. acute poisoning led to death in a few days.—W. Hughes.

2127

MILLER, R. F. and PHILLIPS, P. H. The metabolism of fluorine in the bones of the fluoride-poisoned rat. *J. Nutrition*, 1953, 51, 273-281. [Dept. Biochem., Univ. Wisconsin, Madison.]

For 6 weeks 36 weanling albino rats were given a ration containing 0.1 per cent. NaF (450 p.p.m. F), and 14 comparable controls were given the same ration without added NaF, containing 3 to 5 p.p.m. F. Both groups were then given the un-supplemented ration for 32 weeks, during which animals were killed every 4 weeks for femur analysis.

Administration of F caused the incisors to become chalky and retarded skeletal growth and calcification. Upon withdrawal of F there was a rapid return of the incisors to normal appearance, and by 17 weeks of age the skeletons of treated and control animals were similarly calcified and of

normal size. At the end of 6 weeks of F administration the F content of the femur was 1.80 mg., or 15,400 p.p.m. fat-free dry weight, compared with 0.04 mg. and 225 p.p.m. for controls. Four weeks later the values for previously F-treated animals were 1.20 mg. and 5000 p.p.m.; after 8 weeks they were 1.00 and 3000. Thereafter total F increased slightly and F concentration decreased to values of 1.07 mg. and 2300 p.p.m. at 32 weeks. In controls during the same period F concentration in the femur increased to 350 p.p.m. and total F in the femur to 0.20 mg.—F. C. Aitken.

2128

ZIPKIN, I., LIKINS, R. C. and MCCLURE, F. J. Deposition of fluorine in the bones and teeth of rachitic rats. *J. Dent. Res.*, 1953, 32, 692-693. *Proc.* [Nat. Inst. Dent. Res., Bethesda, Md.]

2129

FISCHER, R. B. and MUHLER, J. C. Effects of several fluoride reagents upon the surface structure of dental enamel. *J. Dent. Res.*, 1953, 32, 645. *Proc.* [Dept. Chem., Indiana Univ., Bloomington.]

2130

ACKERMANN, P. G. and IVERSEN, K. Radio-iodine excretion in the aged. *J. Gerontol.*, 1953, 8, 458-464. [Div. Gerontol., Sch. Med., Washington Univ., St. Louis, Mo.]

The subjects, 24 men and 25 women over 60 years of age, without sign or symptom of thyroid or renal disease, were given approximately 25 μ C. of carrier-free radio-active iodine by mouth in the morning. They were allowed to eat the usual hospital breakfast 1 hr. later and the usual diet for the next 3 days, while urine collections were made. Basal metabolic rates and renal clearance rates were estimated. Less labelled I was excreted than was observed by other investigators in young adults, but no significant change was noted with increasing age over 60 in renal excretion rate or thyroid I uptake.—B. W. Simpson.

2131

BURROWS, B. A. and ROSS, J. F. (with DELL, E. S., GRAHAM, D. E. and HAMMACK, D. F.) The thyroidal uptake of stable iodine compared with the serum concentration of protein-bound iodine in normal subjects and in patients with thyroid disease. *J. Clin. Endocrinol.*, 1953, 13, 1359-1368. [Radioisotope Unit, Veterans Admin. Hosp., Boston, Mass.]

2132

STORAASLI, J. P., ROSENBERG, S. and FRIEDEL, H. L. Effect of food and water on thyroid

uptake of radioiodine (I^{131}) in rats. *Proc. Soc. Exp. Biol. Med.*, 1953, **83**, 748-750. [Dept. Radiol., W. Reserve Univ., Cleveland, Ohio.]

Male rats of Wistar strain weighing from 120 to 150 g. were fed for 4 weeks on a diet low in I, and were then divided into 8 groups of 3 and given single intraperitoneal injections of 0.1 μ C. I^{131} per g. bodyweight. The experiments lasted 6 or 24 hr. after injection. Two groups received no water and no food for 36 hr. before the administration of I^{131} and none for the next 6 or 24 hr.; 2 groups received food and water up to the time of injection, but none afterwards; 2 groups received food and water up to the time of injection, but only water after the injection; and the last 2 groups received food and water all the time. The measurements of radio-activity in the thyroids and excreta were made by a scintillation counter, and the results were recorded as a percentage of the administered dose in each organ examined.

At the end of the experiment the control rats receiving neither food nor water had accumulated, in 6 and 24 hr., 56 and 51 per cent. of the dose of I^{131} , respectively. The rats given water alone had collected 30 and 16 per cent., and those given food and water 18 and 7 per cent. There was a correspondingly increased excretion of I^{131} when water alone or food and water together were administered. The amount of stable I in the food and water had no influence on the uptake of I^{131} by the thyroid.

As the rate of radio-active I uptake by the thyroid gland is used for evaluating thyroid status, it follows from these studies that the procedure should be standardised as far as possible by restricting the amounts of fluid and food consumed before and during the test.—B. W. Simpson.

2133

KEENAN, D., NIKOLAICZUK, N. and OLIVER, W. F. Retention of iodine by the chick. *Poultry Sci.*, 1953, **32**, 908. *Proc.* [Macdonald Coll., McGill Univ., Que.]

See also Abst. 1862.

IRON AND COPPER

2134

ERDMANN-MÜLLER, G. J., SAUER, H. and WENDE-ROTH, H. Untersuchungen der Eisenausscheidung durch die Haut. [Excretion of iron through the skin.] *Klin. Wochenschr.*, 1953, **31**, 719-720. [I. Med. Klin., Univ. Hamburg, Eppendorf.]

2135

SHODEN, A., GABRIO, B. W. and FINCH, C. A. The relationship between ferritin and hemosiderin in rabbits and man. *J. Biol. Chem.*,

1953, **204**, 823-830. [Dept. Med., Sch. Med., Univ. Washington, Seattle.]

2136

NISSIM, J. A. Experimental siderosis: a study of the distribution, delayed effects and metabolism of massive amounts of various iron preparations. *J. Pathol. Bacteriol.*, 1953, **66**, 185-204. [Dept. Pharmacol., Guy's Hosp. Med. Sch., London.]

2137

SEN, D. P. Studies on food-iron. 1. Absorption of iron by rats. 2. Excretion of iron by rats. 3. Biological availability of iron in rice (*Oryza sativa*) and ferric chloride as measured by the amount of iron retained in liver, spleen and body. 4. Effect of proteins on the haemopoiesis due to the iron in rice (*Oryza sativa*). 5. Haemopoietic effect of iron in rice (*Oryza sativa*), wheat (*Triticum vulgare*), lentil (*Lens esculenta*), ferric-phytate, egg-yolk of duck, lecitho-vitellin protein and ferric chloride. *Ann. Biochem. Exp. Med.*, 1952, **12**, 29-36; 53-58; 59-62; 67-74; 103-110. [Dept. Appl. Chem., Univ. Coll. Sci. Technol., Calcutta.]

1. Rats were maintained on milk, containing not more than 0.04 mg. Fe per litre, for 3 to 4 weeks after weaning, and were then divided into a control group of 5 and 2 experimental groups of 8 rats. The experimental diet consisted of a limited amount of whole dried milk, and liquid cow's milk to appetite. The two experimental groups received daily 0.2 mg. Fe, as ferric ammonium citrate and as haematin, respectively. After 4 weeks all were killed.

The Fe content of liver, spleen and carcass and the blood Hb value were much higher in the rats given ferric ammonium citrate than in either of the other groups. Little or no Fe appeared to have been retained from haematin.

In a second experiment, with adult rats, there was little difference in total Fe content between those which received ferric ammonium citrate and those which received no Fe supplement.

2. Adult rats were maintained on cow's milk. After the first week one group continued on this regimen, a second and third received supplements of ferric ammonium citrate by mouth and intraperitoneal injection, respectively, and haemolytic anaemia was produced in the fourth group by injection of phenylhydrazine. Fe content of faeces and urine was estimated, and the rats were killed after a week of this treatment.

There was little difference in Fe excretion in urine between the groups, except for an increased excretion in the group which received Fe by injection, when 8.8 per cent. of the injected dose ap-

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peared in the urine. Absorption of Fe taken by mouth by the second group was negligible, almost all the Fe appearing in the faeces. There was some Fe in the faeces of all rats, indicating excretion from the tissues. Although groups 3 and 4 had increased Fe in spleen and liver there was no increase in faecal Fe, which suggested a limited power of excretion by the intestinal tract.

3. The Fe in cooked rice was less available to rats than a similar quantity of Fe given by mouth as ferric chloride.

4. Rats made anaemic by a milk diet were divided into 3 groups of 6 animals. They received diets each containing rice 80, yeast 3 and salt mixture 3 parts. Protein was supplied, respectively, by dried iron-free egg yolk 14, egg albumin 13, or low-iron casein 14 parts. Each provided just over 5 mg. Fe per 100 g. diet.

Hb regeneration was somewhat greater on egg yolk than on the other diets, but Fe consumption in this group was also slightly greater. Fe contents of carcass, spleen and liver were not significantly different between groups.

5. In experiments similar to those in paper 4 above, egg yolk, lecitho-vitellin and ferric chloride were more effective in promoting Hb regeneration than were cereal grains or ferric phytate. There was a close relation between haemopoietic effects and availability of Fe in the different foods.

D. Duncan.

2138

DICK, A. T. **The control of copper storage in the liver of sheep by inorganic sulphate and molybdenum.** *Austral. Vet. J.*, 1953, **29**, 233-239. [Div. Animal Health, C. S. I. R. O., Animal Health Res. Lab., Parkville, Victoria.]

Copper was estimated in liver biopsy samples taken at the beginning and end of an experiment of 3 months' duration with 6 groups of 5 wethers. Sheep with equal intakes of Cu stored more Cu in the liver when the diet was oat hay than when it was alfalfa hay. When the molybdenum intake was raised from 0.5 to 10.5 mg. daily, storage of Cu was significantly decreased only in animals on a diet of alfalfa hay.

In a second experiment with groups of 3 sheep, Mo limited Cu storage in sheep on oat hay as well as on alfalfa hay if the sulphate intake from oat hay was supplemented with inorganic sulphate so as to equal that from alfalfa hay.—F. C. Aitken.

2139

FRICK, E. and LAMPL, F. **Über die Entwicklung des Gehirns von Ratten bei Kupfermangel. [Development of the brain in rats deprived of copper.]** *Klin. Wochenschr.*, 1953, **31**, 912-913. [Neurol. Klin., Univ. Hamburg, Eppendorf.]

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Young and adult rats were reared and maintained on a milk diet for several generations; first and third generation animals were studied. All the animals developed Fe deficiency anaemia. The mean serum Cu in young rats was 51.43 μ g. per 100 ml., range 19 to 70 and in old rats 54.43, range 30 to 77. The mean for healthy normal rats was 245.8, range 184 to 395. None of the rats deprived of Cu showed signs of nerve lesions, and histological examination of the brain and cord showed no abnormality. It is concluded that for production of swayback disease some influence additional to deficiency of Cu must operate.

L. Wills.

See also Absts. 1791, 1914, 2042, 2152.

OTHER MINERALS

2140

DITTRICH, H. **Die Wirkung kleinster Kobaltgaben auf Blutbildung und Eisenstoffwechsel. [Effect of minute amounts of cobalt on blood formation and iron metabolism.]** *Deutsch. med. Wochenschr.*, 1953, **78**, 1658-1660. [Evangel. Krankenhaus, Vienna.]

A new synthetic compound of Co and chlorophyll, when used in the treatment of several types of anaemia, gave completely satisfactory results in the low dosages of 200 and 400 μ g. Co, given intramuscularly. Such minute amounts of Co, given in the form of a simple salt or in other complex compounds, are ineffective. The effectiveness of the Co-chlorophyll compound is probably due to the combination of Co with the porphyrin III ring, and it is suggested that there may be a relationship with vitamin B₁₂. The compound is well tolerated, and apparently quite innocuous.

See also Abst. 2182, Vol. 24.—M. B. Richards.

2141

STEPHAN, R. M. and HARRIS, M. R. **The effect of manganese in the diet on dental caries in the rat.** *J. Dent. Res.*, 1953, **32**, 708. *Proc. [Nat. Inst. Dent. Res., Bethesda, Md.]*

2142

ARRINGTON, L. R. and DAVIS, G. K. **Molybdenum toxicity in the rabbit.** *J. Nutrition*, 1953, **51**, 295-304. [Dept. Animal Husb., Florida Agric. Exp. Stat., Gainesville.]

Dutch rabbits were given a basal ration of commercial pellets to appetite, with greens once a week. Twenty-four weanling rabbits in groups of 2 to 5 were given sodium molybdate at levels of 0.14, 0.05, 0.10, 0.20 and 0.40 per cent. Mo in the ration. Five weanling rabbits were controls and 2 others were given 0.20 per cent. Mo and 0.02 per cent. Cu in the ration. Groups of 2 or 3 mature rabbits were given the basal ration supplemented with Mo at different levels and 4 were controls.

Rabbits given 0.1 per cent. Mo or more showed signs of poisoning: anorexia, loss of weight, alopecia, slight dermatosis and anaemia. In some of the young rabbits there was also abnormality of the front legs. The 2 given 0.02 per cent. Cu with the Mo showed no sign of poisoning.

Of the 5 weanling rabbits given 0.1 per cent. Mo, 3 were given a drench of copper sulphate when their condition was serious. There was rapid recovery except that the leg abnormality, present in 2, persisted. The 2 other rabbits in this group showed only moderate signs of poisoning and gradually recovered without treatment. All rabbits given 0.4 per cent. and 6 out of 8 given 0.2 per cent. Mo died.

The Mo and Cu contents of the basal ration were 2.7 and 16.4 p.p.m., respectively.

F. C. Aitken.

2143

HENDRICK, C., KLUG, H. L. and OLSON, O. E. **Effect of 3-nitro, 4-hydroxyphenylarsonic acid and arsanilic acid on selenium poisoning in the rat.** *J. Nutrition*, 1953, **51**, 131-137. [Biochem. Stat., S. Dakota Agric. Exp. Stat., S. Dakota State Coll., College Station.]

A diet containing 10 p.p.m. selenium was toxic for rats. 3-Nitro:4-hydroxyphenylarsonic acid or arsanilic acid at levels providing arsenic at 2.5 to 86 p.p.m. gave some protection against liver damage, but only arsanilic acid at 86 p.p.m. improved survival and growth rate. Complete protection was not obtained. It is suggested that the compounds might have some value for use on the farm.

D. Duncan.

2144

JOHANSEN, E. and HEIN, J. W. **Effect of strontium chloride on experimental dental caries in the Syrian hamster.** *J. Dent. Res.*, 1953, **32**, 703. *Proc.* [Sch. Med. Dent., Univ. Rochester, N.Y.]

2145

CHALLENGER, F. **The biological importance of organic compounds of sulphur.** *Endeavour*, 1953, **12**, 173-181.

2146

KYANK, H. Gravimetrische Neutralschwefelbestimmungen im Urin normaler Schwangerer und bei Schwangerschaftstoxikosen. [Gravimetric estimation of neutral sulphur in the urine of normal pregnant women and women with pregnancy toxæmia.] *Arch. Gynäkol.*, 1953, **182**, 793-800. [Frauenklin., Univ. Leipzig.]

Urinary excretion of neutral S was the same in healthy non-pregnant women as in healthy women

in late pregnancy, the average values for 50 subjects being 13.3 and 13.1 per cent., respectively, of the total S excretion. For 50 women in early pregnancy the average was 14.8 per cent. For 21 normal pregnancies the average neutral S excretion in the parturition period was 16.3, and in the first 24 hr. *post partum* 14.5 per cent. For 15 patients with toxicosis the corresponding values were 21.4 and 18.4 per cent. In pregnancy toxicosis, especially with marked oedema, the neutral S excretion was high in the early days in hospital, the average for 30 patients on admission being 24.0 per cent. These high values point to faulty oxidation in pregnancy. In general excretion fell to normal in a few days, when rest in bed and diet had reduced the oedema, although other signs of toxicosis did not completely disappear. A diet containing about 68 g. protein did not then increase neutral S excretion, which showed that the toxicosis patients, under these conditions, were capable of oxidising quantitatively the protein of the diet.—M. B. Richards.

2147

KEENER, H. A., TEERI, A. E., HARRINGTON, R. V. and BALDWIN, R. R. **Metabolic fate of S^{35} in the lactating cow when fed $S^{35}O_2$ preserved silage.** *J. Dairy Sci.*, 1953, **36**, 1205-1211. [Dept. Dairy Husb., New Hampshire Agric. Exp. Stat., Durham.]

Three small silos were filled with chopped clover with a little timothy grass. After the forage was compacted it was injected with 2, 4 or 6 lb. $^{35}SO_2$ per ton of forage. After 5 months the silos were opened and the contents were offered to cows during 30 hr. Urine, faeces and milk were collected from each cow and periodic blood samples were taken for 14 days.

Most of the ^{35}S was recovered as sulphate in water-soluble form in the silage. When the silage was eaten about two-thirds of the ^{35}S was absorbed and for the most part excreted in the urine. About 1 to 5 per cent. was secreted in the milk, and from 10 to 12 per cent. of this was in protein. Most of the activity in the urine and milk was found within 54 hr. after the last of the $^{35}SO_2$ silage was consumed, but active S was found in the faeces for a further 2 days.—W. Godden.

2148

DZIEWIATKOWSKI, D. D. **Sulfate-sulfur metabolism in the rat fetus as indicated by sulfur-35.** *J. Exp. Med.*, 1953, **98**, 119-128. [Hosp., Rockefeller Inst. Med. Res.]

To determine whether sulphate S can be transferred from the maternal organism to the foetus, the distribution of sulphate S in the tissues and embryos of pregnant rats was studied at different

stages of gestation. ^{35}S was found in embryos 24 hr. after its intraperitoneal injection as Na sulphate into pregnant rats, the amount present being directly related to the stage of foetal development. A large fraction of the ^{35}S in the embryo was insoluble in 5 per cent. trichloroacetic acid. This fraction increased with the age of the embryo from about 40 per cent. in the 10-day embryo to 90 per cent. at 20 days. The possibility thus suggested, that some of the isotope was in chondroitin sulphate, was strongly supported by autoradiographs of embryo sections fixed in formaldehyde, which showed that ^{35}S was most highly concentrated in the cartilaginous parts of the skeleton. Estimation of the ^{35}S content of individual tissues showed that the concentration in the humeri of 20-day embryos, still largely cartilaginous, was about 30 times that in the maternal sternum. The concentration in skeletal muscle, brain, heart and skin was also higher than in the corresponding maternal tissues, but was lower in the embryonic intestinal tract than in that of the adult.

M. B. Richards.

2149

GEYER, C. F. **Vanadium, a caries-inhibiting trace element in the Syrian hamster.** *J. Dent. Res.*, 1953, **32**, 590-595. [Freie Univ., Berlin.]

Investigations were prompted by the work of Rygh (see Absts. 719 and 438, Vol. 20).

Of 10 animals, 2 were controls and 8 were given a caries-producing diet for 24 days, the time taken for the appearance of fissure caries on the molars. Half the hamsters were then given daily supplements of 0.08 mg. V_2O_5 , and 25 days later all were killed. Those on the caries diet without V had severe lesions, but in those receiving V caries of the enamel had not advanced into the dentine. Similar results were obtained when the daily dose was 0.04 mg. V_2O_5 : subcutaneous injections of 0.07 mg. at weekly intervals were found also to be protective.—D. Harvey.

2150

GRANDE, F. El papel fisiológico del cinc y sus relaciones con el metabolismo hidrocarbonado. [The physiological role of zinc and its relation to carbohydrate metabolism.] *Rev. española Enferm. Apar. digest. Nutricion*, 1953, **12**, 433-469. [Dept. Fisiol., Fac. Med., Saragossa.] English summary.

From consideration of all the known data it is concluded that, in spite of the many indications in the literature, there is as yet no definite proof of a relation between Zn and carbohydrate metabolism. It is considered that many of the data have been wrongly interpreted and that others are incompatible with present-day knowledge. There is no proof that Zn forms part of the molecule of

insulin as formed by the pancreas, nor is Zn necessary for the physiological action of insulin. The high Zn content of the pancreas appears to be related to the exocrine activity of the gland, since there are proofs of its accumulation in the acinar cells but not in the islets. Deficiency of Zn does not disturb carbohydrate metabolism in experimental animals, according to present knowledge, and no change in Zn metabolism has so far been demonstrated in human diabetes. The combination of Zn and alloxan does not explain the diabetogenic action of this substance. This is deduced from the facts that alloxan does not inhibit the activity of carbonic anhydrase, the only compound of Zn known to have a physiological action, and that of the numerous agents capable of combining with Zn, only oxine and dithizone have shown diabetogenic activity, according to some authors, and the diabetogenic effect of these 2 compounds is apparently confined to the rabbit. It is not found in other species which are undoubtedly sensitive to the diabetic action of alloxan.

M. B. Richards.

2151

ODENTHAL, F., BEIGLBÖCK, W., CLOTTEN, R. and CREUTZFELDT, W. Die Wirkung von radioaktivem Zink 65 auf den Blutzucker und die Langerhansschen Inseln beim Kaninchen. [Action of radio-active ^{65}Zn on the blood sugar and islets of Langerhans in the rabbit.] *Klin. Wochenschr.*, 1953, **31**, 864-865. [Med. Klin., Univ. Freiburg i. Br.]

Radio-active ^{65}Zn as the sulphate or acetate was injected intravenously into 15 rabbits in a dose of 12 to 30 mg. Zn with activity from 50 to 150 μC . The animals suffered no visible or histologically detectable injury. There was no effect on the blood sugar, and no sugar appeared in the urine. Excreted ^{65}Zn was almost entirely in the faeces.—E. M. Hume.

2152

VAN REEN, R. **Effects of excessive dietary zinc in the rat and the interrelationship with copper.** *Arch. Biochem. Biophys.*, 1953, **46**, 337-344. [McCollum-Pratt Inst., Johns Hopkins Univ., Baltimore, Md.]

Young rats received for 4 to 5 weeks diets containing from 500 to 700 mg. Zn per 100 g. diet. Cu was added to some diets as well as Zn. Catalase, cytochrome oxidase, diphosphopyridine nucleotidase, isocitric dehydrogenase and alkaline phosphatase were estimated in the liver. Hb was also estimated.

Catalase and cytochrome oxidase activities and Hb were significantly less in rats which received Zn than in controls. Growth rate was also lower. It is suggested that the lower enzyme activity was not due to a direct inhibitory effect of Zn ions, or

to the formation of inhibitory substances in the liver. Other possible reactions are discussed briefly.

Cu, 0.2 or 0.4 mg. daily, given with Zn, 500 mg.

per 100 g. food, gave normal enzyme activities and prevented anaemia, but the rate of growth was still low.—R. Hill.

See also Absts. 1896, 1907, 2053, 2138.

METABOLISM OF WATER

2153

MOOK, H. W. Water- en electrolyt-huishouding. [Water and electrolyte metabolism.] *Nederland. Tijdschr. Geneesk.*, 1953, **97**, 3002-3009. [Assen.]
A review.

2154

Disturbances of fluid and electrolyte balance. 2nd *Internat. Congr. Int. Med.*, 15-18 September 1952; *Acta med. scand.*, 1953, **146**, 35-52 (with discussion 53-55). *Proc.*

2155

REINHARDT, W. O. **Experimental production of hepatic necrosis and fibrosis with water.** *Nature*, 1953, **172**, 915-916. [Dept. Anat., Sch. Med., Univ. California, Berkeley.]

The histological condition of the livers of rats after injection into the portal vein of 20 ml. sterile distilled water in 5 to 10 min. is described. The similarity of these changes to those resulting from the injection of chemical agents suggests that alteration of cellular permeability to water may be a property common to many of these substances.

D. Harvey.

See also Absts. 1566, 2001, 2037.

METABOLISM OF OTHER SUBSTANCES

2156

JONES, D. L. and DE LA HUERGA, J. **The influence of modification of intestinal flora upon choline utilization.** *J. Lab. Clin. Med.*, 1953, **42**, 822. *Proc.* [Chicago, Ill.]
A study in man.

2157

SOLOWAY, S. and STETTEN, D. (Jr.) **The metabolism of choline and its conversion to glycine in the rat.** *J. Biol. Chem.*, 1953, **204**, 207-214. [Div. Nutrit. Physiol., Pub. Health Res. Inst. City of New York, Inc.]

Adult male rats were maintained on Purina chow. Each received a single injection of isotopically labelled material with 0.35 mM sodium benzoate per 100 g. bodyweight after a 24-hr. fast. The fast continued for another 24 hr., during which urine was collected, and hippuric acid was recovered.

Choline and betaine were excellent precursors of glycine, comparable in efficiency to serine. Dimethylethanolamine was relatively inefficient. In rats poisoned with aminopterin the isotope dilutions in the hippuric acid recovered after injection of glycine, betaine or choline did not differ from those in normal animals. It is believed that choline is oxidised to betaine before demethylation to glycine.—D. Duncan.

2158

DU VIGNEAUD, V., KINNEY, J. M., WILSON, J. E. and RACHELE, J. R. **Effect of the presence of labile methyl groups in the diet on labile**

methyl neogenesis. *Biochim. biophys. Acta*, 1953, **12**, 88-91. [Dept. Biochem., Cornell Univ. Med. Coll., New York.] French and German summaries.

Eight rats received a diet containing homocystine and choline, but no methionine; the percentage composition was sucrose 73, salt mixture 4, glycine 0.1, L-hydroxyproline 0.1, L-proline, 0.2, DL-serine 0.2, L-aspartic acid 0.2, DL-alanine 0.4, L-tryptophan 0.4, L-arginine HCl 0.6, L-histidine HCl 0.7, L-tyrosine 1.0, DL-threonine 1.4, DL-phenylalanine 1.5, DL-isoleucine 1.8, DL-valine 2.0, L-glutamic acid 2.0, L-leucine 1.3, L-lysine HCl 1.9, NaHCO₃ 1.4, water-soluble vitamins 1, maize oil 3, DL-homocystine 1 and choline chloride 0.8, with vitamins A, D, E and K. After 10 days 2 rats had the choline replaced by methionine and 4 received no choline. Later, deuterium oxide was given in the drinking water for 3 weeks before the rats were killed.

The 4 rats receiving no choline derived from 24.4 to 34.3 per cent. of their labile methyl groups from labelled body water, but those receiving choline or methionine only 5.5 to 10.4 per cent. The appearance of deuterium in the labile methyl groups thus reflected the degree of new formation of these groups.—D. Duncan.

2159

SCHLÜSSEL, H. **Die Sparwirkung mehrwertiger Alkohole im Ernährungsstoffwechsel und einige Bemerkungen über die Verbreiterung unserer Ernährungsbasis. Kurze Mitteilung.** [The sparing action of polyhydric alcohols in the metabolism of food with comments on the

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broadening of our basis of nutrition. **Short communication.**] *Klin. Wochenschr.*, 1953, **31**, 768-769. [Med. Klin., Univ. Cologne.]

2160

VITALE, J. J., DI GIORGIO, J., McGRATH, H., NAY, J. and HEGSTED, D. M. **Alcohol oxidation in relation to alcohol dosage and the effect of fasting.** *J. Biol. Chem.*, 1953, **204**, 257-264. [Dept. Nutrit., Harvard Sch. Pub. Health, Boston.]

Ethanol-1-¹⁴C was injected into the peritoneum of rats and the rate of metabolism of ethanol was measured by estimating the ¹⁴CO₂ in the respired air. The rate of oxidation of ethanol was directly proportional to the amount administered up to about 2.5 to 3.0 g. per kg. bodyweight. At higher levels the rate declined. Fasting decreased the rate of oxidation of ethanol at the 2.4 g. level of administration, the extent of the decrease depending on the length of the fast. Fasting also decreased the ability of liver homogenates to oxidase ethanol.—W. Godden.

2161

BURRI, M. Zur tierexperimentellen Prüfung eines neuen Lebertotalextraktes. [**Proof by animal experiment of a new liver extract.**] *Experimentia*, 1953, **9**, 385-387. [Versuchsb. Robopharm. Lab., AG, Basle.]

A whole liver extract, Ripason, which had been shown by Jasiński (Abst. 5033, Vol. 23) to be of value in the treatment of infective hepatitis or cirrhosis of the liver, was given to rats with experimental liver injury due to CCl₄ poisoning or partial hepatectomy. It was shown that the extract improved liver function as indicated by bromosulphalein clearance tests; it had a lipotropic action as indicated by a reduced fat content in the liver, and it prevented to a considerable extent the fall in blood serum albumin resulting from liver injury.—W. Godden.

2162

HARTMANN, F. Versuche über die lipotrope Wirkung eines Leberextraktes. [**Lipotropic action of a liver extract.**] *Klin. Wochenschr.*, 1953, **31**, 720. [Med. Klin., Univ. Göttingen.]

2163

MAKINO, K., KINOSHITA, T., SATOH, K. and SASAKI, T. **Orotic acid as one of the growth-factors of mice.** *Nature*, 1953, **172**, 914-915. [Dept. Biol. Chem., Med. Sch., Univ. Kumamoto, Japan.]

A group of littermate mice were fed on a diet of rice starch, casein, lard, salt mixture, dried yeast and cod liver oil and subsequent litters from the same dam were given the same diet with 5 mg. orotic acid daily. At the eleventh day of the experiment the control animals ceased to grow and later their weight fell, but those receiving orotic acid continued to increase in weight. The acid is thought to be essential for the growth of mice and possibly also for the growth of calves. [It is not clear whether dosage is per litter or per animal.]

D. Harvey.

2164

SÖRBYE, Ö., KRUSE, I. and DAM, H. **Activity of cosmene and alloöcimene as nutritional coagulation factors.** *Acta chem. scand.*, 1953, **7**, 1015-1016. [Dept. Biochem. Nutrit., Polytechnic Inst., Copenhagen.]

In extension of earlier work (Abst. 1671, Vol. 21) the ability of certain hydrocarbons to raise the level of the 11-coagulation factor in the blood plasma of chickens was tested. Alloöcimene had considerable activity, the minimum dose to give maximum activity being 0.14 µg. per g. bodyweight. Cosmene, 2:6-dimethyl-1:3:5:7-octatetraene, had about one-third the activity of alloöcimene.

W. Godden.

2165

POPE, G. S., ELCOATE, P. V., SIMPSON, S. A. and ANDREWS, D. G. **Isolation of an oestrogenic isoflavone (biochanin A) from red clover.** *Chem. and Indust.*, 1953, No. 41, 1092. [Nat. Inst. Res. Dairying, Univ. Reading.]

By partition chromatography on columns of celite 545, a crystalline compound was obtained from extracts of English broad red clover. It was identified, by its physical characteristics and preparation of derivatives, with 5:7-dihydroxy-4'-methoxyisoflavone (biochanin A) isolated from germinated chana grain by Siddiqui (*J. Sci. Indust. Res. India*, 1945, **4**, 68). By the mouse uterine weight method it was found to have oestrogenic activity about equal to that of genistein.

W. Godden.

METABOLISM OF CELLS, TISSUES, ETC.

GENERAL PHYSIOLOGY

2166

BING, R. J., SIEGEL, A., VITALE, A., BALBONI, F., SPARKS, E., TAESCHLER, M., KLAPPER, M. and EDWARDS, S. **Metabolic studies on the human**

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heart in vivo. 1. **Studies on carbohydrate metabolism of the human heart.** *Amer. J. Med.*, 1953, **15**, 284-296. [Dept. Med., Med. Coll. Alabama, Birmingham.]

Blood was obtained from the coronary vein by direct intubation of the coronary sinus in 52 patients, and mixed venous blood was obtained from the pulmonary artery or the right ventricle. Nine patients were in cardiac failure, 3 with low output and 6 with thyrotoxicosis and high output.

In the non-failing heart, glucose consumption varied from 1.37 to 13.65 mg. per 100 g. heart muscle per min. and extraction rose with arterial glucose concentration to a maximum when the latter was about 110 mg. per 100 ml. Injection of a 10 per cent. glucose solution resulted in increasing glucose extraction by the myocardium regardless of the arterial glucose concentration.

In low or high output failure there were decreased ability of the heart to convert glucose or lactate energy to work, and increased uptakes. Spontaneous variations in arterial lactate concentration were related to lactate uptake by the heart. From 0.35 to 11.5 mg. lactate per 100 g. muscle per min. were used, but glucose seemed to be preferred. Pyruvate utilisation was small, up to 0.83 mg. per 100 g. muscle per min., and could not be definitely related to arterial pyruvate concentration. The total aerobic metabolism of glucose, lactate and pyruvate usually fell far short of the total O_2 consumption of the left ventricle, even with high arterial glucose concentration, and the heart appears to depend for its energy also on non-carbohydrate sources.—D. Duncan.

2167

VILLEE, C. A. **The metabolism of human placenta *in vitro*.** *J. Biol. Chem.*, 1953, **205**, 113–123. [Dept. Biol. Chem., Harvard Med. Sch., Boston, Mass.]

From 30 placentae at term, and 33 of gestational age ranging from 6 to 37 weeks, the metabolism of macroscopically healthy slices was tested *in vitro*, beginning within 5 min. after vaginal or abdominal delivery. [It is not stated whether obstetrical abnormalities were associated with these placentae.] The slices were incubated at 37° C. in Warburg vessels, and glucose, pyruvate and lactate, labelled with ^{14}C , were added to the incubation medium. The technique for each experiment is described in detail.

The results are presented as scatter diagrams with a superimposed line [which is apparently the mean. The scatter of results about this line is wide, and there are no statistical data by which the validity of the means can be assessed.]

The dry weight : wet weight ratio rose throughout gestation from a mean of approximately 7.5 per cent. in early pregnancy to a mean of approximately 12.0 per cent. at term. The mean glycogen content per unit dry weight fell steeply until about mid-pregnancy, and then more gradually until term. The ability of the placenta to form gly-

cogen *in vitro* decreased with increasing gestational age, and was inhibited completely by omitting K from the incubating medium.

Oxygen utilisation per unit dry weight fell until about mid-pregnancy and then remained almost constant until term, and there appeared to be a small decrease in the mean ability to produce and use glucose and pyruvate and to produce lactate throughout pregnancy.

The placental slices were unable to metabolise glycerol, and it appeared that the placenta had no phosphorylating enzyme.

Insulin in the incubating medium was found to accelerate glucose utilisation, and both cortisone and aqueous adrenal cortical extracts decreased the use of oxygen and glucose.

Eight experiments were made on placentae from women with pre-eclamptic toxæmia; these did not differ significantly from "normal" placentae of comparable age. Two hydatidiform moles were found to use oxygen, glucose and pyruvate at lower rates than placentae of corresponding age.

It is concluded that with increasing gestational age there is a general decrease in the metabolic activity of the placenta.—F. E. Hytten.

2168

BERTALANFFY, L. V. and PIROZYNSKI, W. J. **Tissue respiration, growth and basal metabolism.** *Biol. Bull.*, 1953, **105**, 240–256. [Dept. Biol., Fac. Med., Univ. Ottawa.]

For preliminary report see Abst. 3685, Vol. 21.

Tissues were obtained from rats maintained on Purina chow, but restricted to tap water for 12 to 18 hr. before being killed.

Q_{O_2} of heart, lung, kidney and brain showed no relation to body size, but diaphragm showed a significant decline in Q_{O_2} with increasing body-weight. The logarithmic curves of liver and thymus Q_{O_2} against bodyweight showed distinct breaks at 100 g. bodyweight, at the time when the relative growth rates of these organs change. Current theories on the decrease of total B.M.R. with growth are discussed.—D. Duncan.

2169

BARTLETT, G. R. and MARLOW, A. A. **Erythrocyte carbohydrate metabolism. 1. The flow of C^{14} -glucose carbon into lactic acid, carbon dioxide, cell polymers, and carbohydrate intermediate pool. 2. Chromatographic isolation of monophosphoglycerate, diphosphoglycerate, and adenosine triphosphate and their metabolic turnover with glucose carbon.** *J. Lab. Clin. Med.*, 1953, **42**, 178–187; 188–192. [Scripps Metabol. Clin., La Jolla, Calif.]

1. Defibrinated human blood was incubated for 4 hr. at 38° C. with uniformly labelled ^{14}C glucose; the red blood cells were then separated and

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washed with cold isotonic saline, the surface coat of leucocytes and fat particles being aspirated off and discarded. The cells were extracted with trichloroacetic acid, the extract was divided into 5 fractions and the radio-activity of their C was estimated. In the time allowed for incubation half of the lactic acid C formed was derived from radio-active glucose, the remainder coming from the unlabelled carbohydrate storage mixture in the cells. This in turn was replaced by ^{14}C from glucose. The insolubles from the trichloroacetic acid extraction had no significant activity, emphasising the red cell's inability to form protein or fat. Slightly less than 1 per cent. of the glucose C went to $^{14}\text{CO}_2$, and it was calculated that this was probably due to contaminating reticulocytes and leucocytes rather than to any real respiratory capacity of the mature red cell. The fractions of the extract were analysed for glucose, lactic acid, fructose, ribose, adenine, triose, total C, C derived from metabolic glucose, total P, inorganic P, and inorganic P hydrolysed at 10 min., 1 hr. and 3 hr. From these results an estimate was made of the amounts of the different phosphates, phosphoglyceride and diphosphopyridinenucleotide present.

2. The barium-insoluble fraction of the trichloroacetic acid extract referred to above was separated by ion exchange chromatography into its C constituents. The results from the measurement of radioactivity of the individual constituents indicate a high turnover rate with glucose C for diglycerophosphate and to a lesser extent for monoglycerophosphate, none for adenine and possibly a trace for ribose-5-phosphate.

W. Godden.

2170

RENOLD, A. E., TENG, C. T., NESBETT, F. B. and HASTINGS, A. B. **Studies on carbohydrate metabolism in rat liver slices. 2. The effect of fasting and of hormonal deficiencies.** *J. Biol. Chem.*, 1953, **204**, 533-546. [Dept. Biol. Chem., Harvard Med. Sch., Boston, Mass.]

For part 1 see Abst. 954, Vol. 22.

Utilisation of glucose and pyruvate was studied with liver slices from rats, using ^{14}C -glucose uniformly labelled in all C atoms, and ^{14}C -pyruvate labelled in the α -carbon.

Liver slices from rats fasted for 18 to 24 hr. deposited in the medium 65 per cent. less glycogen from glucose and 35 per cent. less from pyruvate than livers from rats fed to appetite. Livers from alloxan-diabetic rats showed a consistent net glycogen decrease during incubation and deposited less total glycogen than those of normal controls, and of this glycogen 3 glucose units were obtained from pyruvate for every one from glucose, a reversal of the normal ratio. There was much more glucose produced, 2 or 3 times the normal amount, accounted for by glycogen breakdown, conversion of

pyruvate to glucose, and increased glucose production from unidentified sources. Similar results were obtained from livers of rats after removal of the pancreas. Adrenal removal did not alter the normal metabolism and when it was imposed on alloxan diabetes net glycogen breakdown decreased slightly and glucose output considerably. Pituitary removal had effects similar to those of adrenal removal.

After fasting for 18 to 24 hr. the livers of alloxan-diabetic rats retained on the average $76.7 \mu\text{M}$ glycogen per g. tissue, whereas in normal animals liver glycogen after such a fast is negligible.

D. Duncan.

2171

MEDES, G., SPIRITES, M. A. and WEINHOUSE, S. **The estimation of fatty acid synthesis in rat liver slices.** *J. Biol. Chem.*, 1953, **205**, 401-408. [Lankenau Hosp. Res. Inst., Philadelphia, Pa.]

Male rats previously fed on a stock diet were starved for 24 to 48 hr. before being fed for 1 day on a diet containing 55 per cent. sucrose and 15 per cent. each of casein, glucose and milk powder. Liver slices were then incubated in the presence of Na acetate labelled with ^{14}C in the methyl or carboxyl group, lactate labelled with ^{14}C in the α -carbon, or ^{14}C glucose labelled uniformly in all the carbon atoms; the incubations were at 38°C . in oxygen for 4 hr. The radio-activity of respired CO_2 , fatty acids, acetoacetate and cholesterol was then estimated.

The rate of fatty acid formation was estimated by comparing the specific activities of the acetoacetate and fatty acids. Incorporation of ^{14}C from acetate, lactate and glucose into CO_2 , acetoacetate, fatty acids and cholesterol was proportional to substrate concentration over a wide concentration range. It was calculated that from 4 to 22 days are required for replacement of half the liver fatty acids, as compared with 1 to 2 days reported by Pihl *et al.* (Abst. 2305, Vol. 20) from experiments on living rats.—G. A. Garton.

2172

CHEN, R. W., CHAPMAN, D. D. and CHAIKOFF, I. L. **Acetoacetate conversion to fatty acids in liver: the role of insulin and the nutritional state of the animal.** *J. Biol. Chem.*, 1953, **205**, 383-393. [Dept. Physiol., Sch. Med., Univ. California, Berkeley.]

Liver slices were prepared from rats which had been fed on a stock diet, some of which had then been fasted, and from animals rendered diabetic with alloxan, some of which had been treated with insulin. The slices were incubated with acetoacetate labelled with ^{14}C in the carbonyl C atom. The ^{14}C content of the resulting CO_2 and fatty acids was estimated.

Liver slices from animals kept on the stock diet readily incorporated the labelled C atom of acetoacetate into long-chain fatty acids. This incorporation did not occur in the liver tissue of fasted or diabetic rats, but did take place when the latter had been given insulin injections. Possible mechanisms for the formation of fatty acids from acetoacetate are discussed.—G. A. Garton.

2173

GEYER, R. P., MEADOWS, M. F., MARSHALL, L. D. and GONGAWARE, M. S. **The influence of sodium, potassium, and lithium on fatty acid metabolism.** *J. Biol. Chem.*, 1953, **205**, 81–85. [Dept. Nutrit., Harvard Sch. Pub. Health, Boston, Mass.]

Liver and kidney slices obtained from male rats of Wistar strain which had been maintained on a stock diet were incubated at 38° C. for 1 hr. under oxygen with pentanoic acid-1-¹⁴C or octanoic acid-1-¹⁴C as substrate. The incubation media contained 9 parts of NaCl and 1 part of sodium phosphate-HCl buffer; isotonic KCl or LiCl solutions were substituted for the NaCl solution to give media containing 15 or 77 m.equiv. K or Li per litre. The radio-active CO₂ and acetoacetate produced were estimated.

In liver slices, both K and Li increased breakdown of octanoate, which was reflected mainly in acetoacetate production. The ratio of acetoacetate to ¹⁴CO₂ was below 1 in an all-Na buffer medium, but above 3 when K or Li was present. Potassium caused an increase in both acetate and ¹⁴CO₂ produced from pentanoate. Octanoate metabolism by kidney slices was increased by K, but not by Li.—G. A. Garton.

2174

ARTOM, C. **Role of choline in the oxidation of fatty acids by the liver.** *J. Biol. Chem.*, 1953, **205**, 101–111. [Dept. Biochem., Bowman Gray Sch. Med., Wake Forest Coll., Winston-Salem, N. Carolina.]

Male albino rats were maintained on stock diet containing 25 per cent. protein and 5 per cent. fat or a diet containing 5 per cent. fat and 5 per cent. casein. The latter diet was supplemented with choline chloride or guanidoacetic acid as required. Liver slices, homogenates or particle suspensions were prepared and incubated with ¹⁴C-labelled stearate or palmitate; the radio-activity of the CO₂ and acetoacetate evolved during the incubation was estimated.

Liver preparations from animals on the low-protein diet produced less ¹⁴CO₂ than preparations from animals on stock diet. Choline added to the low-protein diet generally restored the ability of the liver to produce ¹⁴CO₂ at a high rate. The amounts of labelled acetoacetate formed were pro-

portional to those of ¹⁴CO₂. Irrespective of previous dietary history, the addition to liver preparations of choline, betaine aldehyde, betaine or phosphorylcholine did not stimulate the production of ¹⁴CO₂.

It is suggested that the lipotropic effect of choline may be due to a large extent to increase of fatty acid oxidation in the liver.—G. A. Garton.

2175

CURRAN, G. L. and CLUTE, O. L. **Effect of cations on cholesterol synthesis by surviving rat liver.** *J. Biol. Chem.*, 1953, **204**, 215–219. [Res. Labs., Mary Imogene Bassett Hosp., Coopers-town, N.Y.]

2176

REICHARD, P. and LAGERKVIST, U. **The biogenesis of orotic acid in liver slices.** *Acta chem. scand.*, 1953, **7**, 1207–1217. [Biochem. Dept., Karolinska Inst., Stockholm.]

Experiments *in vitro*, the methods for which are fully described, were of two kinds. In the first a labelled substance considered likely to be a precursor of orotic acid, and unlabelled orotic acid, were incubated with the slices; orotic acid was then isolated from the medium and, after partial degradation, the distribution of the isotope within its molecule was deduced. In the second, incubation was with the supposed precursor or with orotic acid, both unlabelled, but in presence of ¹⁵NH₄Cl, after which the distribution of ¹⁵N in the orotic acid was studied.

The evidence was that N₃ plus C₄, C₅, C₆ and C₇ of orotic acid were derived from aspartic acid and that L-ureidosuccinic acid was a normal intermediate in the formation of orotic acid in liver slices.

D. Harvey.

2177

HIRSCHMAN, A., SOBEL, A. E. and FANKUCHEN, I. **Calcification. 10. An X-ray diffraction study of calcification *in vitro* in relation to composition.** *J. Biol. Chem.*, 1953, **204**, 13–18. [Dept. Anat., Coll. Med., State Univ. New York.]

Sections from the proximal ends of the tibiae of rachitic rats were incubated in buffered solutions containing Ca and P in different ratios or none. Diffraction patterns were obtained of bone at specific points in the sections.

Bone formed *in vitro* gave an apatite diffraction pattern similar to that of bone formed *in vivo*. No evidence was obtained of the presence of CaHPO₄, but its formation during early stages of calcification was not disproved.—R. Hill.

2178

POLONOWSKI, M., CARTIER, P. and PICARD, J. **Effet du glucose et du glycogène sur la minéralisation *in vitro* du cartilage ossifiable normal.**

N.A. and R., April 1954

[Effect of glucose and glycogen on normal cartilage ossification *in vitro*.] *C.R. Acad. Sci.*, 1953, **237**, 1287-1289.

See Title 720, Vol. 21 and Abst. 2047, Vol. 23.

Sections of ossifiable cartilage from sheep embryos were placed for 20 hr. at 37° C. in mineralising solutions containing Ca, P as adenosinetriphosphate (ATP) or orthophosphate, and glucose or glycogen.

The cartilage utilised glucose, for the most part anaerobically, with little formation of citrate. The presence of glucose greatly diminished mineralisation by ATP. Utilisation of glycogen was slight and did not affect mineralisation. Inhibitors of glucose breakdown, monoiodoacetic acid or NaF, increased mineralisation, but inhibitors of the aerobic phase, cyanide, malonate and fluoracetate, were without effect. The results demonstrate the antagonism between glucose breakdown and mineralisation by ATP.—D. Duncan.

2179

MARKS, P. A., HIATT, H. H. and SHORR, E. **Factors influencing deposition of calcium and strontium in cartilage *in vitro*.**

HIATT, H. H., MARKS, P. A. and SHORR, E. **Effects of inhibitors on calcium deposition in cartilage *in vitro*.** *J. Biol. Chem.*, 1953, **204**, 175-185; 187-195. [Russell Sage Inst. Pathol., Cornell Univ. Dept. Med., New York.]

Sections were prepared from the proximal end of the tibia and distal end of the femur of rachitic rats for tests of mineralisation *in vitro*.

Sr and Ca were deposited in a similar manner, but higher concentrations of Sr and phosphate than of Ca and phosphate were required. Phloridzin and iodoacetamide inhibited deposition of Ca and Sr, but KCN did not. Sections were stained for glycogen before incubation, and calcification took place in regions which originally contained glycogen. When sections were treated with amylase to hydrolyse glycogen, there was hardly any calcification during subsequent incubation in solutions containing Ca and phosphate.

In similar experiments calcification was reduced by temperatures above and below 37° C.

The deposition of Ca was not inhibited by 2:4-dinitrophenol, azide, malonate, or anaerobic conditions, which indicated that oxidative processes were not essential in endochondral calcification.

In tests with inhibitors of alkaline phosphatase, it was found that the enzyme was required only when P was present as phosphoric esters.—R. Hill.

2180

BOSTRÖM, H. and MÄNSSON, B. **Factors influencing the exchange of the sulphate group of the chondroitin sulphuric acid of cartilage *in vitro*.**

Vol. 24, No. 2

Ark. Kemi, 1953, **6**, 23-37. [Dept. Chem., Karolinska Inst., Stockholm.]

A standard method was devised of incubating costal cartilage from calves 1 to 3 days old for 30 min. with Krebs Ringer bicarbonate solution containing Na₂SO₄ labelled with ³⁵S. Thereafter the chondroitin sulphuric acid was isolated by the authors' procedure (Abst. 1512, Vol. 24) and its radio-activity was estimated. The effects of a number of changes in conditions were then studied.

Homogenisation of the cartilage or heating to between 43° and 47° C. before incubation, or raising the temperature to 50° C. during incubation, almost completely inhibited incorporation of ³⁵S; aeration with N during incubation diminished it to about 36 per cent. of the standard. Rapid freezing followed by thawing, or keeping of the cartilage for 4 days after collection, also destroyed the power to take up ³⁵S. Cartilage from 2- and 12-year-old animals had activities 57 and 26 per cent., respectively, of that of cartilage from suckling calves. The effects of 28 enzyme inhibitors were studied; many had positive effects and the most powerful were those known to react with SH groups in proteins. Cortisone also was strongly inhibitory.—D. Harvey.

2181

BOSTRÖM, H. and ODEBLAD, E. **The influence of cortisone upon the sulphate exchange of chondroitin sulphuric acid.** *Ark. Kemi*, 1953, **6**, 39-42. [Dept. Chem., Karolinska Inst., Stockholm.]

In experiments with adult rats 1 mg. cortisone acetate per 100 g. bodyweight was given daily and on the fifth day they and control animals were injected with Na₂SO₄ labelled with ³⁵S; 48 hr. later they were killed. Chondroitin sulphuric acid was prepared (Abst. 1512, Vol. 24) from the costal cartilage and its radio-activity was measured; autoradiographs were obtained from samples of skin. Experiments *in vitro* were with costal cartilage from young calves incubated in Krebs Ringer bicarbonate solution with different amounts of cortisone alcohol.

The evidence from the experiments *in vivo* was of a reduction of radio-activity in the treated group to 60 per cent. of that of the control and from the work *in vitro* of about 35 per cent. inhibition when the concentration of cortisone alcohol was 10 mg. per cent.—D. Harvey.

2182

ZIRM, K. L., PONGRATZ, A. and POLESOFKY, W. **Über die Bildung von Assoziationskomplexen des Chlorophyllins mit Eiweisskörpern. [Formation of association complexes by chlorophyllin with proteins.]** *Biochem. Ztschr.*, 1953,

324, 536-543. [Forsch. Lab., Lannacher Heilmittel G.m.b.H., Lannach, Styria.]

When freed from lipoprotein, water-soluble Mg chlorophyllin is capable of forming with proteins a complex which shows properties similar to those of the natural chromo-lipoprotein complex. The central Mg atom can be replaced by other metals, and it has been found that Co, Ni, Zn and Cu chlorophyllins behave similarly in forming protein complexes. It is believed that this power of combining with protein and its decomposition products is of special significance in connection with the tissue-positive ("gewebspositive") and deodorising properties of the natural substance. The therapeutic significance of the complexes depends on the nature of the central atom. See also Abst. 2140, Vol. 24.—M. B. Richards.

See also Abst. 1906.

GROWTH AND METABOLISM OF TUMOUR CELLS

2183

EULER, H. v. Biochemische Vorgänge bei der Bildung und beim Wachstum von Tumoren. [Biochemical events in the formation and growth of tumours.] *Deutsch. med. Wochenschr.*, 1953, **78**, 1755-1758. [Vitamin Inst., Univ. Stockholm.]

This is a review which discusses briefly the carcinogenic action of butter yellow, the breakdown of that substance by demethylation first to the monomethyl compound, still carcinogenic, and finally to the harmless aminoazobenzol. Riboflavin is thought to have some protective effect which is ascribed to its action in the formation of precursors of haem and in tryptophan metabolism.

I. Leitch.

See also Absts. 1781, 1805, 1821, 1864.

METABOLISM OF GROWTH, REPRODUCTION AND SENESCENCE

GROWTH

2184

RAO, M. N. and BHATTACHARJEE, B. Physiological 'norms' in Indians. 2. Growth curves of children in first year. *Indian J. Pediat.*, 1953, **20**, 249-260. [Sect. Physiol. Indust. Hyg., All-India Inst. Hyg. Pub. Health, Calcutta.]

For Part 1 see Abst. 2584, Vol. 22.

Tables are presented showing mean weights and lengths with standard deviations, weekly from birth to 1 year, of 43 breast-fed middle-class infants. From these growth curves have been constructed which are recommended for use as normal standards in paediatric practice.

The data are compared with some published data from other countries.—F. C. Aitken.

2185

MEREDITH, H. V. Growth in head width during the first twelve years of life. *Pediatrics*, 1953, **12**, 411-429. [Iowa Child Welfare Res. Stat., Iowa City.] Spanish summary.

2186

HAMMOND, W. H. Physique and development of boys and girls from different types of school. *Brit. J. Prev. Social Med.*, 1953, **7**, 231-239. [Minist. Health, London.]

As part of a wider post-war study, weights, heights and other body measurements were ascertained for boys and girls from 5 to 18 years in independent schools (group A) and up to 14 or 15 years in council schools in the best (group B) and worst areas (group C) of several industrial towns. There were about 1430 children from

independent and 1495 from council schools. They were measured by a team of 3, each of whom was responsible for particular measurements throughout. The means are tabulated for groups A and C and the results for these are compared and shown graphically. The means for group B, the standard deviations, and details of the techniques, are obtainable from the author.

Body measurements could be divided into 2 groups: those which showed a steady increase with age, namely, height, arm and leg length, length and breadth of hand and foot, and inter-acromial, interspinous and ankle breadth; and those which showed a pubertal spurt, more especially in boys, namely, weight, sitting height, girths of trunk, knee, arm and wrist, and intertrochanteric breadth. Group A children surpassed group C in height and most length measurements, being about 2 years' growth ahead; for girth measurements the differences were much less. The inter-relationships of the measurements are discussed. The ratio sitting height: leg length and other indices of maturity indicated that group A were also about 2 years ahead in "shape". It is suggested that "the different mature physiques of the social groups are due to these differences in the rate of development rather than to specifically social differences".—W. M. Deans.

2187

DEAN, W. T., SHEFFIELD, M. M., HARPER, L. J. and TATE, M. T. Growth trends of children in Southwest Virginia. *J. Amer. Dietetic Assoc.*, 1953, **29**, 1109-1112. [Virginia Polytech. Inst., Blacksburg.]

See also Abst. 4046, Vol. 20.

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2188

KEMSLEY, W. F. F. **Changes in body weight from 1943 to 1950.** *Ann. Eugenics*, 1953, **18**, 22-42.

The paper is intended to show the weight changes which occurred in groups of British adults over the period 1943 to 1950 and to aid the planning of any future inquiry by providing information on the variation of individuals over time. A description of the samples used is given in an earlier paper by the same author, dealing exclusively with the cross-sectional survey in 1943 (Abst. 4119, Vol. 20).

The relative merits of a series of consecutive independent samples and a longitudinal study are considered, as well as the disadvantages of both systems.

The results obtained from a small group weighed throughout the survey are presented, interpreted and compared with those obtained in 1943. Both sets of data are similar, apart from the greater age of the smaller set and the fact that they show a greater annual increase in mean weight.

Annual comparisons are used to investigate annual and quarterly weight changes.

Finally, the variances of weight changes are examined. The correlation between different weighings of the same individual is high even when the weighings are as far as 7 years apart. From this it can be concluded that longitudinal surveys are more efficient than cross-sectional inquiries in estimating weight changes over time, requiring approximately one-fifteenth of the number of subjects for comparable accuracy, provided sufficient numbers of the original sample remain available. Although weight is distributed log-normally, the distribution of weight changes tends to normality as the interval between weighings becomes longer.—A. W. Boyne.

2189

BOTKIN, M. P. and WHATLEY, J. A. (Jr.) **Repeatability of production in range beef cows.** *J. Animal Sci.*, 1953, **12**, 552-560. [Dept. Animal Husb., Oklahoma Agric. Exp. Stat., Stillwater.]

Birth and weaning weights were recorded at Stillwater, Oklahoma between 1944 and 1951, where 151 range Hereford cows produced 620 calves and weaned 603, and at Fort Reno Experiment Station in 1950 and 1951, where 49 cows produced and weaned 98 calves. After elaborate corrections for sex of calf, age of dam and year, correlation between records for first and second calf were worked out.

It is concluded that in the selection of beef cows the weaning weights of their first calves can be taken as an indication of future performance.

E. L. B. Haskew.

2190

ORTH, E. Beobachtungen über das Wachstum von Hühnern nach dem Schlupf. [Studies of the growth of poultry after hatching.] *Arch. Geflügelk.*, 1953, **17**, 285-292. [Inst. Tierzuchtlehre, Landw. Hochsch., Hohenheim.] English summary.

Abstract of a dissertation based on a large number of body measurements of the preserved and dried skeletons of 70 White Leghorns all hatched on the same day and killed at 1 day, 1 week, 2, 4, 8 and 16 weeks and 2 years 6 months. The great variations in the rate of growth of different bones and the resulting changes in proportions are shown in tables and diagrammatically.

W. M. Deans.

2191

Nutrition and growth factors. Symposium. VIth Internat. Congr. Microbiol., 1953, pp. 196, Price 16s. 6d. Fond. Emanuele Paterno, Rome; Blackwell Scientific Publications, Ltd., Oxford.

2192

SCHWARTZ, N. B. **Relationship between body weight and gastrocnemius-soleus muscle weight in growing rats.** *Growth*, 1953, **17**, 123-126. [Dept. Physiol., Northwestern Univ. Med. Sch., Chicago, Ill.]

The gastrocnemius-soleus muscle on one or both sides was removed by dissection under Nembutal or Barbitol anaesthesia from 95 male Sprague-Dawley rats aged from 21 to 110 days and weighing from 30 to 420 g. The muscle was weighed, dried for 24 hr. at 100° C. and re-weighed.

Dry weight was linearly related to wet weight except at very low muscle weights. There was no significant difference between right and left muscles. The wet weight of the first muscle removed was slightly but significantly greater than that of the second; the former was used. Contrary to the usual assumption, the relation between muscle weight and bodyweight was not linear over a wide range of bodyweight, but was expressed by the equation :

Muscle weight (wet) in g. =

$$1.77 (\text{Bodyweight in g.})^{1.24}.$$

W. M. Deans.

See also Abst. 1579.

REPRODUCTION AND LACTATION: MAMMALS

2193

MACMAHON, B. and GORDON, J. E. **Epidemiologic inferences derived from maternal age.** *Amer. J. Med. Sci.*, 1953, **226**, 326-349. [Dept. Epidemiol., Harvard Univ. Sch. Pub. Health, Boston, Mass.]

A review, with 202 references, dealing with the effect of maternal age on reproductive performance and on birthweight and other characteristics of the infant, with some account of experimental work on animals.

2194

GHOSE, C. **Studies of metabolism of calcium, inorganic phosphorus and cholesterol in pregnancy with albuminuria.** *Calcutta Med. J.*, 1953, **50**, 373-379. [Dept. Midwifery, Nilratan Sircar Med. Coll., Calcutta.]

Mild albuminuria in pregnant women was not accompanied by any difference in serum Ca, inorganic P or cholesterol from values in normal pregnancy.—R. Hill.

2195

MUKHERJEE, D. P., ROY, A. and BHATTACHARYA, P. **The effect of feeding thyroprotein on semen quality and on some physiological conditions of goats. 1. Effect on reaction time and semen characteristics.**

ROY, A., MUKHERJEE, D. P., LUKTUK, S. N. and BHATTACHARYA, P. **2. Effect on sperm nutrient and its utilisation.**

MUKHERJEE, D. P., JAWA, S. S. and BHATTACHARYA, P. **3. Effect on pulse rate, rate of respiration, body temperature and body weights.** *Indian J. Vet. Sci.*, 1953, **23**, 1-7; 9-14; 15-24. [Animal Genetics Sect., Indian Vet. Res. Inst., Izatnagar.]

1. Thyroprotein, 1 g. daily, was given by mouth to 7 male goats. A comparable control group received no thyroprotein. The experiment was made between May and August, when environmental temperatures were high. Semen samples were taken twice weekly from all animals. The degree of sex vigour was also estimated by noting the time interval between release of the goat and ejaculation ("reaction time").

Thyroprotein had no effect on sperm motility, number of spermatozoa in the ejaculate or percentage abnormal sperm. The reaction time was unaffected. There was a significant decrease in semen volume and a corresponding increase in sperm concentration in goats given thyroprotein.

2. Thyroprotein had no effect on the methylene blue reduction time in the semen samples taken during the above experiment. The initial fructose content decreased and the rate of fructolysis increased during thyroprotein feeding. There was a high correlation between sperm concentration and rate of fructolysis.

3. Statistical analysis of data collected during the above experiment showed that thyroprotein raised pulse and respiration rates and body temperature and decreased bodyweight.

Pulse rates of control and treated animals increased as air temperatures rose. The control group reacted to a greater degree than the treated animals. An increase of relative humidity tended to decrease pulse rates in both groups when temperature and rainfall were constant. Respiration rates of the treated animals increased with increasing air temperature. Rainfall had no effect on pulse or respiration rate. Body temperatures were unaffected by changes in atmospheric temperature, humidity or rainfall.—J. N. Aitken.

2196

UNDERWOOD, E. J., SHIER, F. L. and PETERSON, J. E. **The effects of prolonged injections of stilboestrol on the ewe.** *Austral. Vet. J.*, 206-211. [Inst. Agric., Univ. W. Australia.]

Mature Merino ewes were given intramuscular injections of stilboestrol in oil daily for 6 months including the normal anoestral period when no progesterone is produced to protect the uterus from the effects of oestrogens. In the first experiment the doses were 1, 2, 4, 8 or 16 mg., and in the second 0.11, 0.33 or 1 mg. daily.

All treated animals in the first experiment showed mammary development during treatment. Raddled entire rams were introduced to the flock, and mating records indicated that the treatment had no effect on the incidence of oestrus, but at all dose levels almost complete infertility resulted. Observations were continued for 3 breeding seasons, and the infertility persisted. Reproduction in control ewes was normal. In the second experiment the permanence of the infertility has not yet been confirmed, but it is thought that even the lower levels of stilboestrol will have permanent effect. Post-mortem findings, which are described, were similar to those in ewes rendered infertile by grazing on subterranean clover pastures.

T. D. Bell.

2197

DEWAR, A. D. **Total metabolism of the mouse after pseudo-parturition and parturition.** *Quart. J. Exp. Physiol.*, 1953, **38**, 263-294. [Dept. Physiol., Univ. Edinburgh.]

Pseudoparturition was induced by crushing the foetuses on the 14th or 15th day of gestation, the day of delivery of the placentae being ascertained by daily palpation. Consecutive 24-hr. balances of water, carbohydrate, fat and protein and estimated energy expenditure were studied in 7 of these mice, in 3 after normal parturition and in non-pregnant controls, and B.M.R. was studied in newborn litters.

Weight losses after parturition or pseudo-parturition were due mostly to water loss which was not due to simple diuresis, as excretion usually fell, but to decreased intake uncompensated by the decrease in excretion. The water

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loss was accompanied by negative Na balance and represented the termination of a water-retaining phase, probably involving mainly extracellular water and associated with the presence of placentae. Decreased food intake in the 3 or 4 days after parturition accounted for a further small loss of weight.

Some loss of N followed parturition or pseudoparturition. No change in fat or carbohydrate metabolism appeared. A decline in energy expenditure occurred in the 3 or 4 days after pseudoparturition, and the B.M.R. was increased before pseudoparturition. The B.M.R. per unit of weight in newborn mice was only about two-thirds that of the mother, and it is thought that an increase in maternal B.M.R. at the end of pregnancy would be masked by the low B.M.R. of the foetuses.

D. Duncan.

2198

NELSON, M. M. and EVANS, H. M. **Relation of dietary protein levels to reproduction in the rat.** *J. Nutrition*, 1953, **51**, 71-84. [Inst. Exp. Biol., Univ. California, Berkeley.]

Groups of 10 normal adult rats were given from the day of mating purified diets of casein, sucrose, hydrogenated cottonseed oil, salts and essential vitamins. Protein contents of 2.5, 5, 10, 15, 20 and 25 per cent. and a protein-free diet were obtained by interchanging casein and sucrose.

Maternal weight gain during gestation decreased with decreasing protein content until with 2.5 per cent. protein or none there was loss of weight. At protein levels above 5 per cent. there was no resorption of litters and young of average size and number were produced. At 5 per cent. protein there was 30 per cent. resorption of implanted ova and the young born were below average weight. With 2.5 per cent. protein or none 90 to 100 per cent. of foetuses were resorbed and the average weight of young born was very low.

Additional groups were given the diets containing 5 and 2.5 per cent. protein or none with the crystalline vitamin supplement doubled and vitamin B₁₂ added. The additional vitamins reduced the percentage of resorptions in the 5 and 2.5 per cent. protein groups but not in the protein-free group.

In a paired feeding trial rats on the protein-free diet consumed 9.2 g. food daily, lost weight during gestation and resorbed 89 per cent. of ova implanted and the young born were small. Pair-fed animals on a 20 per cent. protein diet gained weight and resorbed 11 per cent. of ova implanted and the young were below average weight. When the protein content of the diet of pair-fed controls was increased to 30 per cent. there was 100 per cent. development of ova implanted and the young were of normal birthweight.

The effects of giving a protein-free diet from

before gestation, from 7 days after breeding or for transitory periods during gestation were studied. The incidence of resorption of litters in rats on protein-free diet was much reduced if implantation occurred before the reduction of protein intake.

No young rat with a macroscopic congenital abnormality was observed in the low-protein or protein-free groups.—F. C. Aitken.

2199

WILSON, J. G. **Influence of severe hemorrhagic anemia during pregnancy on development of the offspring in the rat.** *Proc. Soc. Exp. Biol. Med.*, 1953, **84**, 66-69. [Dept. Anat., Coll. Med., Univ. Cincinnati, Ohio.]

Pregnant rats were made severely anaemic by being bled on 3 successive days beginning on the 7th day in 31, on the 9th day in 40, on the 11th in 37 and on the 13th in 25. This frequently caused maternal death or resorption of the litter. Surviving litters were normal except when bleeding was begun on the 9th day, when there was malformation in 2.6 per cent. of the young, retardation of growth in 4 of 13 litters and a slightly higher than normal rate of intra-uterine resorption in litters reaching term. It is suggested that maternal haemorrhagic anaemia is not a great danger to the offspring of surviving litters.—F. C. Aitken.

2200

ILLINGWORTH, R. S. and KILPATRICK, B. (with SCOTT, J. F.) **Lactation and fluid intake.** *Lancet*, 1953, **265**, 1175-1177. [Dept. Child Health, Univ. Sheffield.]

Criteria of successful lactation were gain in weight of baby by the 5th and 9th day, results of test feeds on the 8th day and incidence of full breast feeding on discharge from hospital and at 1 month of age.

The average amount of fluid drunk daily by 106 mothers given no direction about fluid intake was 69.1 oz.; that of 104 mothers advised to drink 6 pints daily was 107.5 oz. No positive correlation was found between any of the criteria and fluid intake. There was a significant negative correlation between fluid intake and milk produced at test feeds. Lactating women should not be persuaded to drink large quantities, but should be allowed to satisfy their own desire for fluid.

F. C. Aitken.

2201

FLYNN, F. V., HARPER, C. and DE MAYO, P. **Lactosuria and glycosuria in pregnancy and the puerperium.** *Lancet*, 1953, **265**, 698-704. [Dept. Clin. Pathol., University Coll. Hosp., London.]

Single samples of urine from 240 non-pregnant women and 132 men, 2373 from 240 pregnant women and 657 post-partum specimens were

tested for reducing sugars by the Benedict method and for lactose and glucose by paper chromatography.

Positive reduction tests occurred in pregnancy about $2\frac{1}{2}$ times and *post partum* about 3 times as often as in the controls. The percentages of urine samples containing lactose were: non-pregnant women 9.6, men 8.3, pregnant women 50.9, women after delivery 86.2. The corresponding percentages of glycosuria were 14.2, 15.9, 24.0, 0.9. Antenatal lactosuria increased in incidence as pregnancy progressed, was found more often in the afternoon and more commonly in primigravidae than in multigravidae. Antenatal glycosuria was found more often in the afternoon and more frequently in older than younger women.

A new spray reagent is described for use in paper chromatography of sugars.—F. C. Aitken.

2202

NIKITIN, V. N. [Biochemistry of lactation and synthesis of fat in milk.] *Uspekhi Sovrem. Biol.*, 1953, **35**, No. 1, 57.

2203

OWEN, J. B. Milk yield of hill ewes. *Nature*, 1953, **172**, 636–637. [Sch. Agric., Univ. Coll. N. Wales, Bangor.]

By the use of a harness, designed to prevent the lamb reaching the ewe's udder but easy to manipulate at suckling time, mean daily milk yields of 32 randomly selected hill ewes with single lambs, grazing on "inbye" land at 1000 ft. above sea level, was found to be 31.79 ± 6.04 oz. over a 6-week period. Pedigree ewes over a shorter period averaged 47 oz. There was a high correlation, $r = +0.79$, between the milk yield of the ewe and the growth of the lamb during the first month and significant correlations between the milk yield of the ewe and the birthweight of the lamb, $r = +0.51$, and the weight of the ewe at tupping, $r = +0.36$.—W. Godden.

2204

SMITH, E. P. and KEYES, E. A. The effect of prepartum milking upon the quantity of milk produced during the subsequent lactation. J.

Dairy Sci., 1953, **36**, 1178–1181. [Dept. Dairy Indust., Montana Agric. Exp. Stat., Bozeman.]

The milk and butterfat production of 19 Holstein and 13 Jersey cows milked for from 2 to 10 days before parturition was compared with the production of 8 Holstein and 7 Jersey cows milked in the normal way. Statistical analysis of the yields of 33 cows which completed a 305-day lactation showed that there was no significant difference in yield of 4 per cent. fat-corrected milk.

J. N. Aitken.

2205

BARTLETT, S., BURT, A. W. A., FOLLEY, S. J. and ROWLAND, S. J. Galactopoietic effects of L-thyroxine and L-triiodothyronine in lactating cows. *J. Endocrinol.*, 1953, **9**, xlii–xliii. [Nat. Inst. Res. Dairying, Univ. Reading.]

See also Absts. 1844, 2508, 2519.

REPRODUCTION: BIRDS

See Absts. 1787, 1969.

SENESCENCE

2206

FRENCH, C. E., INGRAM, R. H., URAM, J. A., BARRON, G. P. and SWIFT, R. W. The influence of dietary fat and carbohydrate on growth and longevity in rats. *J. Nutrition*, 1953, **51**, 329–339. [Dept. Animal Nutrit., Pennsylvania State Coll., State College.]

Male and female rats on a diet containing 22.7 per cent. fat grew fully as rapidly as those on a high-carbohydrate diet with only 3.4 per cent. fat, although their energy intakes were less by 4.8 and 5.7 per cent., respectively, than those of males and females on the latter diet. No seasonal variation in food consumption was found. Longevity decreased considerably in male rats and less, but significantly, in females on the high-fat diet. Although males on this diet had a significantly greater liver fat content than males on the carbohydrate diet, no evidence of abnormality in liver or kidney was revealed histologically, and the frequency of diseases or abnormalities was not greater in the high-fat group.—M. B. Richards.

EXPERIMENTAL STUDIES OF IMMUNITY AND MICRO-ORGANISMS

2207

DESOWITZ, R. S. and WATSON, H. J. C. Studies on *Trypanosoma vivax*. 7. The course of infection of an unsupplemented line in white rats and the influence upon it of a diet of cow's milk and vitamins. *Ann. Trop. Med. Parasitol.*, 1953, **47**, 258–260. [Sect. Protozool., W.

African Inst. Trypanosomiasis Res., Vom, N. Nigeria.]

[Earlier papers in the series were not nutritional.]

Rats receiving cow's milk, with or without added vitamins, were infected by inoculation with blood containing *Trypanosoma vivax*. The course of the infection was similar to that in controls on stock

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diet. Vitamin B₁, vitamin B₆ and Ca pantothenate were without effect. The strain used, although originally requiring supplementary inoculation of sheep serum, has developed the ability to produce virulent and usually fatal infections in rats.

D. Duncan.

2208

KEPPIE, A. A. N. **Modified course of *T. congolense* infection in mice given diets with milk casein.** *Brit. Med. J.*, 1953, ii, 853-857. [Dept. Bacteriol., Univ. Glasgow.]

Groups of 20 mice received stock diet (Rowett Institute diet No. 86), synthetic diets containing 10, 20 or 30 per cent. casein, or bread, milk and oats, for 2 or 3 weeks before they were inoculated with *Trypanosoma congolense* (Busimbi strain). On all the casein diets the development of the parasites was delayed or prevented, though it was acute on both natural diets. Since the bread, milk and oats diet did not prevent growth of the parasite, it is thought that the casein diets lacked some nutrient required by it.—D. Duncan.

2209

RODHAIN, J. L'action de la diète lactée sur les infections à *Plasmodium berghei*, *Plasmodium vinckei* et *Babesia rodhaini* chez les souris. [Effect of a milk diet on infection with *Plasmodium berghei*, *Plasmodium vinckei* and *Babesia rodhaini* in mice.] *Ann. Soc. belg. Méd. trop.*, 1953, 33, 245-257. [Inst. Méd. Trop. Prince Léopold, Antwerp.]

To test the resistance to *Plasmodium vinckei*, an injection of blood containing about 4 million parasites was made into the peritoneum of 4 adult and 5 weanling mice on Maeagraith's milk diet (Abst. 4848, Vol. 23) enriched with vitamins B₁ and B₆, and of 3 adult and 2 young mice on stock diet. None of the mice on the milk diet developed a fatal infection; for the first few days a small number of parasites appeared in the blood, but they disappeared rapidly, except in one weanling mouse in which a heavy infection had developed by the 5th day; it then cleared up but the animal developed a chronic infection when transferred to stock diet.

In experiments with *Plasmodium berghei*, 2 strains were used which usually killed mice in from 12 to 30 days; 2 young and 2 mature mice having the milk diet were infected with one or other of the strains; one mouse was immune but the other 3 died, though they survived a little longer than mice on stock diet.

For the final experiment a highly lethal strain of *Babesia rodhaini*, really a species of *Nuttalia*, was used. The milk diet conferred no immunity and all the animals died, all but one with haematuria.

L. Wills.

2210

CUTHBERTSON, D. P. **Microbiology of digestion with particular reference to farm animals.** *Gegenwartigsprobleme der Ernährungsforschung, Symposium*, Basle, October 1952, 68-83 (with discussion 84-87). Verlag Birkhäuser, Basle, 1953. Price Swiss fr. 32. [Rowett Res. Inst., Bucksburn, Aberdeenshire.]

2211

SIMONNET, H. and LE BARS, H. Rôle des micro-organismes du tube digestif chez les herbivores. [Role of the micro-organisms in the digestive tract of herbivores.] *Rec. Méd. vét.*, 1953, 129, 401-423.

2212

ADAM, K. M. G. **In vivo observations on the ciliate protozoa inhabiting the large intestine of the horse.** *J. Gen. Microbiol.*, 1953, 9, 376-384. [Dept. Biol., Royal (Dick) Vet. Coll., Edinburgh.]

Pony A had fistulae into the caecum and ventral colon; pony B had fistulae into the caecum and into the ventral and the dorsal colon. Pony A was fed for periods of 3 weeks on the following succession of diets: (1) grass only, (2) grass plus 2 lb. oats daily, (3) hay only, (4) hay plus 2 lb. oats daily. Pony B received grass only for 4 weeks and hay only for a further 4 weeks. Total and differential counts of ciliate protozoa were made in the formalised gut samples by methods developed by the author (*Parasitology*, 1951, 41, 301).

The ponies had different distributions of types of protozoa in their intestines and the effects of different diets on these distributions were not the same. Moreover, wide variations in the daily counts made it difficult to distinguish changes due to diet in the numbers of ciliates. In A, the concentration of ciliates in the caecum showed no significant change until hay and oats were given, when the count fell. In the ventral colon grass with oats caused an increase in the total count, and a further increase resulted from hay alone. In pony B, no change in the total count was found in the caecum or dorsal colon when hay replaced grass, but in the ventral colon a slight fall ($P < 0.05$) in the total count was recorded. Differential counts of protozoal types in the caecum and colon are described and discussed.

Ciliates from the ventral colon of pony A were successfully transmitted to the ventral colon of pony B, in an attempt to establish the more varied fauna of A in B and to follow the effects of this on the distribution of existing types in the colon of B. Two types of *Cycloposthium* were established by introducing ventral colon contents from A into the stomach of B. On the 10th day after transfer *C. edentatum* formed less than 1 per

cent. of the population of the ventral colon of B, but by the 14th day it formed 26 per cent. *C. dentiferum* took 6 weeks to become as numerous as *C. edentatum*. Thereafter the numbers of the two species remained similar. Direct introduction of ventral colon contents of A into the ventral colon of B, through the fistula, established in B all the types found in A, but the distribution of types never became similar. The colour of the contents of the colon of B became similar to that of A. The distribution of types in the caecum of B was not affected by the changes in the fauna of the ventral colon, but numbers in the dorsal colon increased. In the ventral colon itself total counts rose sixfold after the introduction of the two *Cycloposthium* species, and a further significant rise was noted after the establishment of all the species from A.

Conjugation, which had formerly been seen only in *Blepharocorys* spp. and *Charonantes equi*, was seen after transmission of ciliates in a few pairs of *Cycloposthium bipalinatedum* and once in *C. edentatum*.—M. J. Masson.

2213

HEALD, P. J., KROGH, N., MANN, S. O., APPLEBY, J. C., MASSON, F. M. and OXFORD, A. E. **A method for direct viable counts of the facultatively anaerobic microflora in the rumen of a sheep maintained on a hay diet.** *J. Gen. Microbiol.*, 1953, **9**, 207–215. [Rowett Res. Inst., Bucksburn, Aberdeenshire.]

The nutrient medium contained, in each 12 ml. deep culture bottle: 5 per cent. casein hydrolysate 2 ml., 0.5 per cent. tryptophan solution 0.5 ml., 1.5 per cent. sugar solution 1 ml., 2 per cent. agar dissolved in cleared and buffered rumen liquor 8.5 ml. The rumen liquor was obtained by centrifuging contents from hay-fed sheep, followed by Seitz filtration, and was buffered with phosphates. A series of carbohydrates was studied.

Crude wet rumen contents of a sheep fed only on hay were estimated to contain a population of 10^8 viable facultatively anaerobic bacteria per g., capable of fermenting soluble carbohydrates, including glucose, maltose, cellobiose and salicin. The importance of this facultatively anaerobic population may be considerable.—D. Duncan.

2214

MACPHERSON, M. J. **Isolation and identification of amylolytic streptococci from the rumen of the sheep.** *J. Pathol. Bacteriol.*, 1953, **66**, 95–102. [Rowett Res. Inst., Bucksburn, Aberdeenshire.]

Samples were taken from the rumen of sheep on different diets. Twenty-five strains of amylolytic streptococci were isolated on yeast-starch-

agar plates and 12 were studied in detail. In fermentation reactions they were found to resemble *Streptococcus bovis* and the coccus RO-6TBR isolated from the rumen by Gall and Huhtanen (Abst. 2463, Vol. 21).

In Lancefield grouping tests the reactions of the rumen strains were weaker and slower to develop than those of *Str. bovis* or *Str. faecalis*. Supernatant fluid of a 10-hr. culture of a rumen streptococcus gave a strong precipitin reaction with homologous antiserum in dilutions up to 1 in 128 of the antigen, which appeared completely soluble and had the same precipitin reactions as formamide extracts of whole cells. Cells washed 3 times in saline before agglutination tests gave agglutination titres 20 times that of unwashed cells.

The Neufeld capsule swelling reaction was observed with antisera from rumen strains. Strains 1 and 2 gave a positive reaction to antisera 1 and 2 and a negative reaction to antiserum 3. Strain 3 gave a positive reaction with antiserum 3 only. *Str. bovis* and *Str. faecalis* were negative to all 3 antisera of rumen strains. Rumen contents did not interfere with the reaction. A positive reaction of capsules of rumen streptococci in whole rumen contents was demonstrated when antisera of the isolated strains were mixed with the rumen contents.—M. J. Masson.

2215

HUDMAN, D. B. and KUNKEL, H. O. (with HOOD, B. J.) **Rumen microorganisms. Factors influencing protein synthesis by microorganisms in vitro.** *J. Agric. Food Chem.*, 1953, **1**, 1060–1062. [Dept. Biochem., Texas Agric. and Mech. Coll. System, College Station.]

Inocula of rumen liquor from sheep with a fistula fed on alfalfa hay were added to a saline medium containing glucose and powdered cellulose, the volume was made up to 333 ml. and the mixture was incubated at 39° C. The pH was adjusted initially and at 3-hr. intervals to between 6.5 and 6.6. The protein of samples drawn every 3 hr. was precipitated by tungstic acid and N was estimated in the washed precipitate.

Protein synthesis increased when urea or ammonium citrate was added; increasing the concentration of urea from 0.1 to 0.9 per cent. or that of ammonium citrate by equivalent amounts produced more rapid synthesis. A comparison of ammonium acetate, bicarbonate and citrate with urea showed that comparable synthesis occurred at similar concentrations of N, except that synthesis with citrate was very variable. The optimum proportion of inoculum to inorganic medium was 60 in 333 ml.; larger inocula depressed protein synthesis. The protein content of the inoculum was closely related to the greatest protein concen-

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tration in the flasks. Omission of cellulose from the medium made little difference to the results.

A. T. Phillipson.

2216

SIROTNAK, F. M., DOETSCH, R. N., BROWN, R. E. and SHAW, J. C. **Amino acid metabolism of bovine rumen bacteria.** *J. Dairy Sci.*, 1953, **36**, 1117-1123. [Dept. Bacteriol., Univ. Maryland, College Park.]

Mixed suspensions of bovine rumen bacteria were tested for their ability to degrade individual amino-acids, and the effects of carbohydrates and the substrate level of the amino-acids were investigated.

Six of the 22 amino-acids tested were dissimilated by the rumen organisms with the production of CO_2 , NH_3 , acetic, propionic and butyric acids and, from cystine or cysteine, hydrogen sulphide. Neither ketone bodies nor lactic acid was produced. Glutamic acid, serine, arginine, cystine and cysteine were dissimilated mainly to acetic acid, and aspartic acid to propionic acid. Aspartic acid and urea were attacked five times as rapidly as glutamic acid, serine, arginine, cystine or cysteine; 5 μM aspartic acid or urea was the greatest amount which could be completely dissimilated in 2 hr. under the experimental conditions. The greatest production of NH_3 and CO_2 from aspartic acid was recorded at pH 6.9.

Maltose, and to a similar extent glucose and cellobiose, significantly increased dissimilation of aspartic acid. This stimulation ceased when the maltose had been exhausted. Similar results with the other 5 amino-acids were obtained only in large scale dissimilation experiments, because of the much lower normal rate of dissimilation of these acids.

The relationship between these experiments and the chemical reactions in the rumen is discussed.

M. J. Masson.

2217

PRESCOTT, J. M. **Rumen microorganisms, effects of diet and antibiotics on utilization of non-protein nitrogen.** *J. Agric. Food Chem.*, 1953, **1**, 894-896. [Dept. Biochem. Nutrit., Texas Agric. Exp. Stat., College Station.]

Centrifuged rumen liquor freed from protozoa and most of the plant particles was incubated with 0.15 per cent. urea and 1.0 per cent. glucose. The changes in urea plus ammonia N were followed with and without the addition of antibiotics. Aureomycin, terramycin, bacitracin and L-phenylamine penicillin in concentrations ranging from 1 to 300 μg . per ml. depressed the utilisation of N.P.N., and the depression increased with concentration.—A. T. Phillipson.

2218

EISENSTARK, A. and SANFORD, P. **The action of antibiotics on intestinal flora of poultry. 1.**

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Bacterial counts in chickens fed varying levels of Aurofac.

EISENSTARK, A. and DRAGSDORF, R. D. **2. Effect on the growth of intestinal bacteria *in vitro*.** *Poultry Sci.*, 1953, **32**, 837-839; 840-845. [Dept. Bacteriol., Kansas State Coll., Manhattan.]

1. Six pairs of chicks received diets unsupplemented or with Aurofac at 1, 2, 4, 5 or 10 lb. per ton of feed. The chicks were killed when 8 weeks old. Intestinal contents were inoculated quantitatively into media designed to give total counts of aerobic and anaerobic saprophytic bacteria, aerobic counts, and counts of lactobacilli, enterococci, coliform bacteria and yeasts. Significant changes which could be related to the different levels of Aurofac were not found.

2. The effect was investigated of low concentrations of antibiotics on the growth of bacteria isolated from the intestines of 8-week-old chicks and on stock cultures including *Pasteurella* and *Salmonella*. The effect on the morphology of individual bacterial cells was studied with the electron microscope.

Growth of bacteria in plates round pads containing antibiotics was stimulated or inhibited and in some cases both stimulated and inhibited. The numbers of the cultures stimulated and the degree of stimulation were greater round pads soaked in caecal filtrates from birds receiving an Aurofac-supplemented diet than round the caecal filtrate of birds receiving no Aurofac. No inhibition of growth was seen round caecal filtrates from birds receiving Aurofac, and only two of the Aurofac-containing commercial feeds investigated caused inhibition of growth of the bacteria. Generally filtrates from Aurofac-containing feeds stimulated growth. Filtrates from the caeca of chicks receiving an Aurofac-supplemented ration caused as much stimulation of bacterial growth as filtrates from the Aurofac-supplemented feedingstuffs. Nutritional components of filtrates of the caecal contents and the feedingstuffs cannot be excluded as contributing to the stimulation.

Electron micrographs showed that in the stimulated areas enlarged cells and cells of filamentous form were frequently found. Assuming equal viability for "normal" and "stimulated" cells, the cell volume of the "stimulated" cells was 10 to 100 times that of "normal" cells. It is suggested that stimulation of some bacterial cells may take place in the intestine of birds receiving antibiotics.—M. J. Masson.

2219

HOFMANN, K. and SAX, S. M. **The chemical nature of the fatty acids of *Lactobacillus casei*.** *J. Biol. Chem.*, 1953, **205**, 55-63. [Dept. Biochem., Sch. Med., Univ. Pittsburgh, Pa.]

Large batches of *Lactobacillus casei* 7469 were grown on a semi-synthetic medium in carboys. The bacteria were collected by centrifuging and extracted with acetone and ether to yield "free" lipids and subsequently, after hydrolysis with 2N H₂SO₄, to give "bound" lipids. The lipids were saponified and the fatty acids were methylated to yield esters, which were fractionated in a spinning-band semi-micro Piros-Glover column.

Of the 2.9 per cent. of total lipids in the organisms, 21 per cent. was directly extracted with acetone and ether and 79 per cent. was extracted after acid hydrolysis. The major component fatty acids of the bound lipids were palmitic acid 23 per cent., *cis*vaccenic acid 38 per cent., lactobacillic acid 16 per cent. and stearic acid 4 per cent.; the fatty acid composition of the free lipids was much the same.—G. A. Garton.

2220

ELION, G. B., SINGER, S. and HITCHINGS, G. H. **The purine metabolism of a 6-mercaptopurine-resistant *Lactobacillus casei*.** *J. Biol. Chem.*, 1953, **204**, 35–41. [Wellcome Res. Labs., Tuckahoe, N.Y.]

2221

MCLAREN, A. D. and KNIGHT, C. A. **The response of *Leuconostoc mesenteroides* P-60 to some compounds related to lysine.** *J. Biol. Chem.*, 1953, **204**, 417–422. [Dept. Soils, Univ. California, Berkeley.]

Leuconostoc mesenteroides was unable to use in growth a number of compounds related to lysine, and is therefore an excellent organism for estimat-

ing lysine. Five compounds, including 3 polylysins, inhibited the utilisation of lysine.

D. Duncan.

2222

NIELSEN, N. and NILSSON, N. G. **Investigations on the phosphorus metabolism of *Rhodotorula gracilis*.** 1. **The influence of the phosphate content of the nutrient solution on the formation of fat.**

NILSSON, N. G. and NIELSEN, N. 2. **Phosphate and phosphatide amounts in protein yeast and fat yeast.** *Acta chem. scand.*, 1953, **7**, 984–986; 1067–1070. [Royal Inst. Technol., Stockholm.]

1. Reduction of the phosphate content of the nutrient solution below 0.5 g. KH₂PO₄ per litre caused a reduction in the protein content of the yeast, associated with a rise in fat content. When both N and P concentrations were reduced the fat again rose, but not to the same level as when N alone was reduced. This is evidence that P is necessary for fat formation and confirms the findings of Smedley MacLean and Hoffert (*Biochem. J.*, 1923, **17**, 720; 1924, **18**, 1273).

2. Analyses of 3 samples each of protein yeast and fat yeast are reported (see also Abst. 4616, Vol. 19); the sum of protein and fat in each was relatively constant at about 65 per cent. The higher the amount of fat in the yeast, the lower the amount of phosphatide in the fat, the values being from 3 to 5 per cent. in the high- and from 30 to 40 per cent. in the low-fat yeast. The phosphatide content of the fat-free yeast varied little, from 3.2 to 5.5 per cent., thus supporting the view of Belin (*Bull. Soc. Chim. biol.*, 1926, **8**, 1081–1120) that a certain amount of phosphatide is necessary for micro-organisms.—D. Harvey.

See also Absts. 1811, 1820, 1867, 2399.

MISCELLANEOUS FEEDING EXPERIMENTS

2223

TOMARELLI, R. M., LINDEN, E., DURBIN, G. T. and BERNHART, F. W. **The effect of mucin on the growth of rats fed simulated human milk.** *J. Nutrition*, 1953, **51**, 251–259. [Nutrit. Div., Wyeth Labs., Inc., Mason, Mich.]

Young rats received a commercial infant food resembling early human milk and given either liquid or dry. The diet supported limited growth; all the animals in one group died, but in a second group there was no death in 11 weeks. Mucin from pig stomachs, added as 5 per cent. of the solids, supported good growth, but was much less valuable when hydrolysed. A synthetic mixture providing an amount of N similar to that in the mucin was about as valuable as hydrolysed mucin. The beneficial effect of mucin was obtained also with a purified diet. It protected rats against

the toxic effects of iodinated casein when this was added to the infant diet.—D. Duncan.

2224

PICCONI, M. **Alcuni antibiotici come fattori di crescita per il ratto. [Some antibiotics as growth factors for the rat.]** *Boll. Soc. ital. Biol. sper.*, 1953, **29**, 322–324. [Ist. Chim. Biol., Univ. Bologna.]

Groups of young rats fed on a complete diet were given daily from 30 to 150 days of age aureomycin 2.5, terramycin 2.5, or streptomycin 5 mg. Those receiving antibiotics established within the first 15 days a small superiority in growth over those not so treated. The superiority did not subsequently increase; it was on the average about 15 g. for males and 10 g. for females.

E. M. Hume.

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- 2225
YACOWITZ, H. and BIRD, O. D. **Antibiotic levels in the digestive tract of the chick.** *Poultry Sci.*, 1953, **32**, 966-968. [Res. Labs., Parke, Davis and Co., Detroit 32, Mich.]
- 2226
LUYKEN, R., DALDERUP, L. and JANSSEN, B. C. P. **Nutrition and caries. 3. The reproducibility of the caries scoring methods for rats and the influence of gluten on experimental rat caries.** *Internat. Ztschr. Vitaminforsch.*, 1953, **25**, 42-54. [Netherlands Inst. Nutrit., Amsterdam.] German and French summaries.
- The system of scoring described by Keyes (Abst. 1070, Vol. 15) for use with hamsters was modified for use with rats. Fifteen animals were examined on 3 occasions by the same investigator and it was concluded that only when the score for a particular lesion was 0.5 or more was the agreement between examinations good. Differences in incidence of between 1 and 4 per cent. could be detected.
- With the same system the incidence of caries was examined in rats given the diet of Hoppert *et al.* (Abst. 569, Vol. 2), the same diet with 40 and 20 per cent., respectively, of yellow maize and wheat gluten instead of 60 per cent. yellow maize, or a stock diet on which caries was known to occur. In P generations replacement of maize by gluten caused a reduction in the incidence of caries but in F₁ generations the advantage disappeared. The data for stock diet animals did not support the view of other workers that caries produced by the Hoppert diet is primarily a fissure caries.
- Parts 1 and 2 of this series appeared in Dutch by Jansen *et al.* and by Nederveen-Fenenga and Dalderup in *Tijdschr. Tandheelk.*, 1951, **58**, 2; 321.
D. Harvey.
- 2227
STEPHAN, R. M. and HARRIS, M. R. **The development of various types of carious lesions in rats fed on a synthetic diet.** *J. Dent. Res.*, 1953, **32**, 687. *Proc.* [Nat. Inst. Dent. Res., Bethesda, Md.]
- 2228
HARRIS, M. R. and STEPHAN, R. M. **Effect of mixing water in the diet on the development of carious lesions in rats.** *J. Dent. Res.*, 1953, **32**, 653. *Proc.* [Nat. Inst. Dent. Res., Bethesda, Md.]
- 2229
ELLIOTT, H. C. (Jr.) and PIGMAN, W. **A study of the effect of a typical infant's diet on the caries incidence of the Syrian hamster.** *J.*
- Dent. Res.*, 1953, **32**, 698. *Proc.* [Dent. Sch., Univ. Alabama, Birmingham.]
- 2230
KLAPPER, C. E. **Dental caries in desalivated hamsters maintained on a starch diet.** *J. Dent. Res.*, 1953, **32**, 659-660. *Proc.* [Sch. Med., Univ. Alabama, Birmingham.]
- 2231
HELMAN, E. Z. and MITCHELL, D. F. **Lactobacilli and dental caries in the hamster.** *J. Dent. Res.*, 1953, **32**, 596-600. [Sch. Dent., Univ. Minnesota, Minneapolis.]
- Female hamsters in 3 groups received a basal diet of wheat flour, powdered milk, maize starch, alfalfa meal and sodium chloride, in one group with added sugar and in another with water containing 20 p.p.m. NaF. No correlation was found between caries incidence and counts of *Lactobacillus acidophilus* in their saliva. The relation found to exist between counts of lactobacilli and coliform bacteria suggested that intestinal lactobacilli introduced into the mouth during coprophagy may affect the true lactobacillus count of the saliva.
- In a second group of hamsters, offspring of these females, weaned on the basal diet and later given the high-sugar diet, correlation between occlusal scores and lactobacillus counts was significant at one examination, but not at a later re-examination. The possibility of faecal contamination makes the significance of these findings doubtful. [The figures for percentage composition of the basal diet give a total of only 85.]
D. Harvey.
- 2232
JENNINGS, R. B. and KEARNS, W. M. **Necrotizing nephrosis in the rat following administration of carbon tetrachloride.** *Arch. Pathol.*, 1953, **56**, 348-359. [Dept. Pathol., Northwestern Univ. Med. Sch., Chicago, Ill.]
- The fatal kidney lesions produced by intraperitoneal administration of CCl₄ in doses above 0.5 ml. per 100 g. bodyweight were not prevented by a diet high in fat and low in protein.
W. M. Deans.
- 2233
ZARROW, M. X., LAZO-WASEM, E. A. and SHOGER, R. L. **Estrogenic activity in a commercial animal ration.** *Science*, 1953, **118**, 650-651. [Dept. Biol. Sci., Purdue Univ., Lafayette, Ind.]
- When castrated mice were fed on a commercial ration there was evidence from the uterine weights that the diet contained an oestrogen. The suspected food was extracted with light petroleum and the extract, after removal of the solvent, was taken up in oil and assayed against oestradiol.

The results revealed that 1 kg. of the diet had an oestrogenic potency equivalent to 3.75 μ g. oestradiol. The oestrogen and its source were not identified. The use of such a diet might easily invalidate many experiments and would interfere with an assay for oestrogen.—W. Godden.

2234

FEURT, S. D. and FOX, L. E. **Effects of oral administration of Spanish moss, *Tillandsia usneoides* L.** *Science*, 1953, **118**, 626–627. [Dept. Pharmacognosy, Coll. Pharm., Univ. Florida, Gainesville.]

Two groups of adult rats, 5 males and 5 females in each, were fed on commercial dog cubes with or without an equal weight of ground Spanish moss. After 30 days they were allowed to mate and after a further 23 days a litter of 12 was born to a female in the group receiving no moss and a litter of 5 to a female in the other group. The first litter grew normally, but the second failed to grow and all died before they were 20 days old. The other females on the dog cubes reproduced normally but those receiving moss failed to reproduce. It is suggested that the waste material from processing of fibres from the moss for the upholstery

industry might be used as a source of oestrogens for beef cattle, to improve meat quality and the efficiency of feed utilisation.—W. Godden.

2235

SILBERBERG, M. and SILBERBERG, R. **Keratomalacia and panophthalmitis in "yellow" mice.** *Amer. J. Pathol.*, 1953, **29**, 951–961. [Snodgrass Lab., Hosp. Div., St. Louis, Mo.]

The mice were of strain YBR/Wi, in which yellow animals show hereditary obesity and diabetes while their grey littermates do not. Both colours and both sexes were included in the 252 mice, groups of which received a stock chow diet, a 30 per cent. fat or a 79 per cent. carbohydrate diet.

Mice of both colours developed changes in the eyes, beginning with corneal capacity. The eyeballs became prominent, corneal ulcers developed and the inflammatory process spread to the whole eye and the eyelids. The incidence was somewhat less in females than in males, and the onset was later on stock diet than on high fat or high carbohydrate intake.

The possible role of vitamin A in the etiology of the lesions is discussed.—D. Duncan.

GENERAL METABOLISM AND FEEDING HABITS OF ANIMALS OTHER THAN MAMMALS AND BIRDS

2236

CLARK, H. **Metabolism of the black snake embryo.** 1. Nitrogen excretion. 2. Respiratory exchange. *J. Exp. Biol.*, 1953, **30**, 492–501; 502–505. [Dept. Zool., Univ. Connecticut.]

2237

KEWALRAMANI, H. G. **H-ion concentration in the alimentary canal of two species of Teleosts, *Cottus scorpius* and *Zoarcas viviparus*.** *Proc. Indian Acad. Sci. [B]*, 1953, **38**, 144–152. [Taraporevala Marine Biol. Stat., Bombay.]

2238

SUNDARAM, T. K. and SARMA, P. S. **Tryptophane metabolism in rice moth larva (*Corcra cephalonica* St.).** *Nature*, 1953, **172**, 627–628. [Biochem. Lab., Univ. Madras.]

Rice moth larvae, when fed on a diet containing 1 per cent. DL-tryptophan or DL-kynurenine, gave yellow faeces; with 0.5 per cent. D-tryptophan the faeces were white. Unlike mammals, these larvae did not convert the kynurenine to xanthurenic acid.

D-Amino-acid oxidase activity in extracts of larval tissue was low, as the extracts failed to liberate ammonia from D-tryptophan.

Paper chromatography suggested that the larval excretory pigments were hydroxykynurenine and kynurenine or a derivative thereof. DL-Tryptophan and DL-kynurenine in the diet yielded almost identical patterns.—D. Duncan.

2239

VENKATACHALA MURTHY, M. R. and SREENIVASAYA, M. **Effect of antibiotics on the growth of the silkworm, *Bombyx mori* L.** *Nature*, 1953, **172**, 684–685. [Indian Inst. Sci., Bangalore 3.]

When silkworm larvae were given aureomycin or chloromycetin as supplement to mulberry leaf there was an increase of from 9 to 10 per cent. in larval and pupal weight and a decrease of from 5 to 8 per cent. in output of silk. When the supplement was an amino-acid mixture approximating in composition to casein, larval weight increased by 15 per cent., pupal weight by 8.5 per cent. and silk output by 2.5 per cent. When both antibiotic and amino-acid mixture were given, weight increased again and silk output increased from 8 to 14 per cent. Similar trends but less pronounced increases were observed when an amino-acid mixture was given approximating in composition to silk fibroin. Terramycin alone or in combination with the amino-acid mixtures had no effect on growth or silk production.—F. C. Aitken.

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2240

SCHNEIDERMAN, H. A. and WILLIAMS, C. M. **The physiology of insect diapause. 7. The respiratory metabolism of the Cecropia silkworm during diapause and development.** *Biol. Bull.*, 1953, **105**, 320-334. [Biol. Labs., Harvard Univ., Cambridge, Mass.]

Respiratory measurements in a Warburg apparatus were made on 150 larvae, pupae and developing adults of the giant silkworm *Platysamia cecropia* and a few pupae of *Samia walkeri*. All were kept at 25° C.

There was a striking and precipitous decrease in rate of O₂ consumption from the time of spinning the cocoon to pupation, from a larval rate of over 1100 c.mm. per g. tissue per hr. to a pupal rate of 16.3 ± 9 . The low rate persisted throughout the diapause. Increasing metabolism appeared a week before visible initiation of adult development, and increased until just before the emergence of the adult moth, when the rate was 312 c.mm. per g. initial pupal weight per hr.

Though O₂ utilisation was almost constant, CO₂ output by diapausing pupae occurred in "bursts" every few hours. The estimation of R.Q. therefore called for long experiments, of at least 17 hr., to encompass two or more CO₂ releases. The average R.Q. was 0.78, S.D. ± 0.093 . After minor injury to the integument the rate of O₂ consumption increased on the average to 287 ± 59 per cent. of the resting value, the increase persisting for some days. The R.Q. was unchanged and the response was not affected by implantation of phenylthiourea. Despite the increase in metabolism after injury, sometimes up to 14-fold, no development was initiated.—D. Duncan.

2241

LUDWIG, D. and WUGMEISTER, M. **Effects of starvation on the blood of Japanese beetle (*Popillia japonica* Newman) larvae.** *Physiol. Zool.*, 1953, **26**, 254-259. [Dept. Biol., University Coll., Univ. New York.]

Larvae of the Japanese beetle collected in autumn and winter were stored until required and were then allowed to feed for 2 weeks, after which they were kept in glass tubes and starved for 1, 2, 3 or 4 weeks in a moist atmosphere. In these

conditions the water content and osmotic pressure of the blood remained constant during the period of starvation. There was no significant change in the protein N of the blood, but amino-N and N.P.N. increased. The fat content increased during the first 2 weeks and then decreased. The reducing substances increased throughout the 4 weeks. It is considered that the blood does not serve as a reservoir for sources of energy during starvation, but that the changes in blood constituents may reflect metabolic changes elsewhere.

A. M. Copping.

2242

LEONE, C. A. **Preliminary observations on intra-specific variation of the levels of total protein in the sera of some decapod Crustacea.** *Science*, 1953, **118**, 295-296. [Dept. Zool., Univ. Kansas, Lawrence.]

2243

CAPURRO, G. M. S. and ZACCHEO, D. **Ricerche sulla presenza di fosfatasi alcalina in tessuti ed organi di molluschi (*Octopus vulgaris*). [Presence of alkaline phosphatase in the tissues and organs of molluscs (*Octopus vulgaris*).]** *Boll. Soc. ital. Biol. sper.*, 1953, **29**, 382-385. [Ist. Anat., Univ. Genoa.]

2244

HULTIN, T. **Incorporation of C₁₄-labeled carbonate and acetate into sea urchin embryos.** *Ark. Kemi*, 1953, **6**, 195-200.

Earlier work with *Paracentrotus* embryos (Titles 4901, 4902 and 4903, Vol. 23) has been extended to *Psammechinus* embryos. ¹⁴C-labelled carbonate showed a sharp rise in rate of incorporation during the blastula stage and a fall in the gastrula stage. Before the mesenchyme blastula stage the utilisation of acetate was not extensive, but it increased rapidly after that stage had been reached and mitochondrial activity had become greater.

D. Harvey.

2245

ROTHSCHILD (Lord) and BARNES, H. **The inorganic constituents of the sea-urchin egg.** *J. Exp. Biol.*, 1953, **30**, 534-544. [Dept. Zool., Univ. Cambridge.]

5. HUMAN DIET IN RELATION TO HEALTH AND DISEASE

DIET AND HEALTH

REQUIREMENTS

2246

MOLCHANOVA, O. P. **Sravnitel'nye dannye o normakh pitaniya naseleniya v SSSR i S.Sh.A. [Comparative data on the standards of nutrition of the population in the U.S.S.R.**

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and U.S.A.] *Gigiya Sanit.*, 1953, No. 3, 40-42.

Nutrition standards proposed by the U.S. National Research Council in 1948 are compared with those proposed by Soviet scientists. There are considerable differences, particularly in protein

allowances. The Soviet proposals are 140 to 160 g. protein daily for a man on heavy work, the energy from protein forming about 14 per cent. of the total energy intake. The corresponding figure suggested by the National Research Council is 70 g., equivalent to about 6 per cent. of the total energy in the form of protein. The National Research Council standards differ considerably for men and women on heavy work, 4500 and 3000 Cal. daily; the Soviet figure is 4500 to 5000 Cal. for men or women on heavy work.—W. Hughes.

FEEDING OF INFANTS AND CHILDREN

2247

Discussion on some problems of prematurity.
Proc. Roy. Soc. Med., 1953, **46**, 877-885.

A discussion on prevention of premature birth, treatment of premature infants and their subsequent development.

2248

STEVENSON, S. S., WIRTH, P., BASTIANI, R. and DANOWSKI, T. S. **Some effects of exogenous thyroid or thyroxin upon premature infants.** *Pediatrics*, 1953, **12**, 263-271. [Elizabeth Steel Magee Hosp., Pittsburgh, Pa.] Spanish summary.

Forty-eight premature infants of birthweight about 1500 g. were studied. Twenty-four were given capsules containing dried thyroid or pills containing thyroxine. Twenty-four controls were given capsules or pills containing lactose. Treatment began when infants were taking enough food to gain in weight, at 10 days of age in controls and 8 days in the study group. The average weights were then 1670 g. and 1590 g., respectively. Treatment was given on the average for 25 days in the control group and 26 days in the study group.

Daily doses of 60 or 120 mg. dried thyroid had no significant effect on clinical condition and progress or on protein-bound I level in serum. Daily intake of 180 mg. dried thyroid or of 0.2 mg. thyroxine did not affect energy and fluid intakes, incidence of gavage, amount of vomiting, skin colour or body temperature but decreased weight gain and increased pulse rate, incidence of diarrhoea and level of protein-bound I as compared with controls.—F. C. Aitken.

2249

BAKWIN, H. **Infant feeding.** *J. Clin. Nutr.*, 1953, **1**, 349-354. [Dept. Paediat., Coll. Med., New York Univ.-Bellevue Med. Centre, N.Y.] Spanish summary.

A review.

2250

RUEDA, P. **Alimentacion natural del niño. [Natural feeding of the infant.]** *Prensa pediat.*, 1953, **4**, 2-8. [Fac. Med., Rosario.]

The problems of breast feeding in Argentina are reviewed and the low rate of natural feeding of infants is deplored. The urgent necessity for better instruction of mothers by their doctors is stressed.—A. M. Copping.

2251

BLAICKLEY, J., CLARKE, S., MACKEITH, R. and OGDEN, K. M. **Breast-feeding: factors affecting success: a report of a trial of the Woolwich methods in a group of primiparae.** *J. Obstet. Gynaecol. Brit. Empire*, 1953, **60**, 657-669. [Dept. Obstet., Guy's Hosp., London.]

In the British Hospital for Mothers and Babies, Woolwich, measures are applied during pregnancy and the puerperium to prevent overdistension of the breasts in the first week of the puerperium. These measures, which in a controlled experiment doubled the proportion of primiparae successfully breast feeding their babies for 6 months, are briefly as follows: the use of glass nipple shields from the 20th week of pregnancy or earlier to correct poor protractility; massage of the breasts and expression of colostrum for the last 4 to 8 weeks of pregnancy; regular removal of surplus milk; and judicious use of stilboestrol during the puerperium. In this trial these measures were applied to 117 primiparae with 117 controls delivered in hospital, and the antenatal measures were applied to 66 primiparae with 64 controls delivered at home.

Of the women delivered in hospital 51 per cent. of those given Woolwich treatment and 26 per cent. of the controls successfully breast fed their infants for 6 months. The difference was statistically significant. There was no significant difference between the performances of control and treated women delivered at home. It was concluded that the important part of the Woolwich method was the treatment during the puerperium. It is recommended that massage and expression should be learnt antenatally so that they can be used in the lying-in period. The early use of glass nipple shields had a beneficial effect on nipples which were poorly protractile and is recommended in such cases.—F. C. Aitken.

2252

DÉCHÈNE, E. **Influence des antibiotiques sur la croissance. [Influence of antibiotics on growth.]** *Laval méd.*, 1953, **18**, 924-929. [Crèche Saint-Vincent de Paul, Quebec.]

A short preliminary account is given of the favourable effect of antibiotics, especially chloromycetin, on the weight increase of feeble infants of

less than 3 months, in whom weight was stationary and no recognised infection existed. Older children did not benefit.—E. M. Hume.

2253

ILLINGWORTH, R. S. **Abnormal substances excreted in human milk.** *Practitioner*, 1953, 171, 533-538. [Dept. Child Health, Univ. Sheffield.]

A short article with some 40 references, dealing mainly with excretion in the milk of drugs taken by the mother, including alcohol and nicotine. Mothers frequently blame some particular food for upsetting the baby, but very little scientific evidence on this is available.—W. M. Deans.

2254

SCHRAMM, E. Anthropologische Berechnungsgrundlagen zweier Säuglingsernährungssysteme. [Anthropological basis of calculation in two systems of infant feeding.] *Öst. Ztschr. Kinderheilk.*, 1953, 9, 76-91. [Gablenzgasse 28, Vienna 16.]

Weight, height and sitting height are discussed mathematically in their relations to one another and as bases for infant-feeding systems.

E. M. Hume.

2255

JOCHIMS, J. Zur Methodik einer klinischen Beurteilung von Säuglingsnahrungen. [On the technique of clinically assessing the value of infants' foods.] *Ztschr. Kinderheilk.*, 1953, 73, 595-600. [Kinderklin., Städt. Krankenhaus-Süd, Lübeck.]

A refinement of the method previously described (Abst. 4932, Vol. 23); the periods of observation are divided into sub-periods of 10 days which are assessed separately.—W. M. Deans.

2256

GOUNELLE, H. and DEMARCHI, M. **Nutritional status of infants and very young children in Baghdad.** *J. Fac. Med. Baghdad, Iraq*, 1953, 17, 42-53. [Baghdad.]

Weight curves from birth to 18 months of age were drawn from data for 1842 infants attending 2 welfare centres; all came from the labouring class. The curve of mean weights was the same as for European children up to the age of 2 months but then fell below European standards, the difference becoming still greater after 7 months. Breast feeding alone was used for 58.7 per cent. of infants, breast feeding with supplements for 32.1 per cent. and cow's milk for 9.2 per cent.; the mean weight of the breast-fed infants was greater than that of the infants in the other groups at all ages up to 12 months but thereafter was definitely lower. The amount of cows' milk given

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was nearly always inadequate. Recommendations for the improvement of infant nutrition are put forward.—L. Wills.

2257

VAN VEEN, A. G. **Research problems concerned with local foods of special value for supplementary child feeding schemes.** *Gegenwartsprobleme der Ernährungsforschung, Symposium, Basle*, October 1952, 299-306. Verlag Birkhäuser, Basle, 1953, Price Swiss fr. 32. [Nutrit. Div., FAO, Rome.]

2258

WICKES, I. G. **A history of infant feeding. 4. Nineteenth century continued.** *Arch. Dis. Childhood*, 1953, 28, 416-422.

See Titles 4939, Vol. 23; 993, Vol. 24.

DIETARY SURVEYS AND INDIVIDUAL STUDIES

2259

DE WAART, A. *et al.* Voeding en voedingstoestand van schoolkinderen en een groep jonge arbeider te Leiden (1950-1951). [Diet and nutritional status of schoolchildren and a group of young workers at Leyden (1950-1951).] *Nederl. Inst. Praev. Geneesk., Rep. No. 22*. H.E. Stenfort Kroese N.V., Leyden, 1953, pp. xv + 190. English summary.

An introductory chapter describes the origin of this study and the general procedures adopted. The schoolchildren were a random sample, from an alphabetical list, of the children aged 6, 7, 8 and 9 in 3 groups of schools roughly representative of 3 social classes. The first study, of 111 children, was in October to December and designed to give the "after summer" state; the second from April to July, with 198 children, to show the "after winter" condition.

Chapter 1 describes the sociological background and clinical examination, including somatometric data, clinical evaluation, and signs of deficiency, with a summary and commentary.

Chapter 2 reports on the diet of the children estimated by one-day history and checked against family food consumption for the week in which the clinical examination was made. The same procedure was used with 61 apprentices at a technical school.

Chapter 3 describes the biochemical analyses made and chapter 4 summarises and discusses the data in English.

In all 210 children were examined, 99 of them twice. The aim was to look for interrelations between diagnostic signs used in routine examination (height, weight, general appearance, "sub-clinical deficiency-symptoms", Hb and others), and biochemical data and estimates of diet. The

"sub-clinical" signs described are angular stomatitis, magenta colour of tongue, xerosis of skin, atrophy and hypertrophy of the tongue papillae, folliculosis of the skin and staring hair. Of these the first 4 showed a significant social gradient and the last appeared only in the poor group. The first 2 were significantly more frequent in spring. But there was no significant difference in vitamin A, carotenoids or vitamin C in the serum of children with and without xerosis, or in riboflavin intake in those with and without angular stomatitis, or in nicotinic acid intake between those with and without atrophic papillae.

There were significant differences in height, weight and sitting height between the well-off and the poor but not between the upper and middle classes. With the difference between total and sitting height as a measure of leg length and of development, a year's delay is estimated for the poor. There were significant correlations of height and weight with energy intake, total and animal and vegetable protein and vitamin C, but not vitamin A or riboflavin. Social class differences were significant except for energy. Hb was significantly correlated with both height and weight but serum protein was not related to either. The *peledisi* index was not correlated with height or weight but agreed well with general clinical assessment of state of nutrition: $r = +0.451$. It was not related to any of the biochemical or diet assessments except total serum protein. Skeletal age showed significantly more retardation among poor children, and skeletal retardation went with significant deficits of height and weight and differences of serum Ca, P and phosphatase, of which none was significant. Finally, there were significant differences between well-to-do and poor in respect only of vitamin A and carotenoids in serum and between well-to-do and middle class for only vitamin C in serum.

Biochemical data for the apprentices and vitamin C in serum for 39 medical students are detailed for comparison.—I. Leitch.

2260

DONATH, W. F., VAN DER MEULEN-VAN EYSBERGEN H. C. and DE WIJN, J. F. Voeding en voedings-toestand van leidse schoolkinderen. [Diet and nutritional condition of Leyden school-children.] *Voeding*, 1953, 14, 459-486. [Nederlands Inst. Praev. Geneesk., Leyden.] English summary.

See above Abst.

2261

GLAJA, A. Prilog poznavanju ishrane seoske dece školskog doba. [Contribution to the study of the nutrition of village schoolchildren.] *Rev.*

Trav. Acad. Serbe Sci., 1953, 28, *Inst. Nutrit.*

No. 2, pp. 37. In Serbian: French summary.

Studies made in 1948 in 2 Serbian villages, presented in tables with French headings, showed that village schoolchildren were inferior to town children in both height and weight. Measurements at 6-monthly intervals revealed that they lost weight during the winter and gained about twice as much in height during the summer as during the winter. These findings are ascribed to inadequate feeding. Children may have to walk long distances to school. They bring their own lunch. Investigation of the lunches in a village in western Serbia on a day in October, which is the best time of the year for food because wheat bread has not yet been replaced by maize bread, showed that even at that season well over a third had maize bread as the principal item. Other frequent lunch items were cheese and kajmak (salted cream). On the average the boys' lunches provided 925 Cal., 32 g. protein and 22 g. fat and the girls' lunches 833 Cal., 27 g. protein and 21 g. fat. Bread supplied about half the protein and 70 per cent. of the energy. Wednesday and Friday, however, are fast days and on these more than half the children brought nothing but dry bread; the corresponding energy and nutritive values were 652, 16, 4; 622, 15, 5.5. Numerous fast days and longer periods of fasting are observed by Serbian peasants of the Orthodox Church; in some families there are as many as 240 days in the year on which no food of animal origin is taken.

The improvement of the feeding of country children is a matter of education in nutrition rather than of economics; better instruction of parents and children and the introduction of school canteens are recommended. (From summary.)

W. M. Deans.

2262

BOUCHE, A. and DESROCHE, H. Les enquêtes alimentaires en France. Aperçus bibliographiques et méthodologiques. [Dietary studies in France. Bibliography and methods.] *Bull. Inst. nat. Hyg., Paris*, 1953, 8, 705-757. [Sect. Nutrit., Inst. Nat. Hyg., Paris.]

2263

WYATT, S. and MARRIOTT, R. Night work and swift changes. *Brit. J. Indust. Med.*, 1953, 10, 164-172. [Med. Res. Counc. Group Res. Indust. Psychol.]

An investigation was made in 1945-46 in 3 works, one of which had a weekly, one a fortnightly and one a monthly change of shift from night to day. One was a rolling mill, another made wagon wheels and the third made motor vehicles. The investigation was mainly non-nutritional but, as a small part of it, 150 of the men were asked about their meal habits. Seventy per cent. brought food,

N.A. and R., April 1954

whether on night or day duty. Various reasons were given for not wanting to use the canteen. Almost all the men ate sandwiches during short breaks whether the canteen main meal was taken or not. The percentage enjoying their food better when on the day shift was 74, on the night shift 3.3 and noticing no difference 22.7. The reasons given for lack of enjoyment on the night shift were the unnatural hours and stomach trouble. The percentage settling down at once to the changed meal-times was 61.3 on transfer from night to day, and 37.3 on changing from day to night. The remainder took varying times to adapt themselves, and a certain number, about a quarter, never became adjusted to the night shift. About 20 per cent. said changing over caused indigestion, more noticeable on starting night shift. None of them had given up night work because of stomach trouble, but none was interviewed among those who worked only the day shift and who might, therefore, have given up night work in the past because of stomach trouble.

E. M. Hume.

2264

FULD, H. and ROBINSON, K. V. **Malnutrition in the elderly.** *Lancet*, 1953, **265**, 860-864. [Newsham Gen. Hosp., Liverpool.]

An account is given of the signs and symptoms in 39 cases of malnutrition admitted to hospital. Thirty-three of the patients were over 60 years of age.

There were some signs of deficiencies of B vitamins; scurvy was diagnosed in 19 on 4 bases, gross shortage of fruit and fresh vegetables in the diet, haemorrhages in skin, subcutaneous tissue and joints, positive Hess test and significant results with saturation tests. All but 3 of the 39 were anaemic; the incidence of achlorhydria was somewhat higher than normal for elderly people.

Response to diet treatment was good, but a follow-up of 12 patients showed that after discharge from hospital 6 had relapsed to poor diets. The economic and social backgrounds of the patients are briefly described.—F. C. Aitken.

2265

TUCKER, R. E., CHALMERS, F. W., CHURCH, H. N., CLAYTON, M. M., FOSTER, W. D., GATES, L. O., HAGAN, G. C., STEELE, B. F., WERTZ, A. W. and YOUNG, C. M. **Cooperative nutritional status studies in the Northeast Region. 4. Dietary findings.** *Rhode Island Agric. Exp. Stat. Bull.* No. 319, June 1952, pp. 24.

4. For earlier papers in this series see Absts. 140, Vol. 22; 3430, 3391, Vol. 23.

Food consumption by 1804 persons, 854 males and 950 females, was measured in 6 States, generally by 7-day diet records. The subjects were classified in the 6 age groups for which the U.S.

National Research Council has made recommendations for allowances of nutrients, and mean intakes of these with standard deviations are tabulated for each age group at the individual centres.

From comparisons of these with the National Research Council recommendations the general conclusion was that shortages of ascorbic acid, calcium, vitamin A and riboflavin were common and that of these the deficiency of ascorbic acid was the most widespread and the greatest. The requirements of the younger age groups were more nearly met than were those of the older groups, and the needs of males than those of females. It is suggested that increased consumption of dairy products, fruit and vegetables would be advantageous in the north-east of the United States. (See also next Abst.)—D. Harvey.

2266

CLAYTON, M. M., BABCOCK, M. J., FOSTER, W. D., STREGEVSKY, S., TUCKER, R. E., WERTZ, A. W. and WILLIAMS, H. H. **Cooperative nutritional status studies in the Northeast Region. 5. Blood findings.** *Maine Agric. Exp. Stat. Bull.* No. 516, May 1953, pp. 59.

5. Data on Hb, ascorbic acid, vitamin A, carotene and alkaline phosphatase in blood were collected. The number of subjects varied with the estimations but values were obtained for Hb for more than 3000 subjects. They were from the 6 States, but in Massachusetts only pregnant women were studied.

For Hb no age or sex difference was found between ages 4 and 10. Between 10 and 12 there was a rise in both sexes which continued beyond 13 years in the boys but not in the girls. Ascorbic acid fell with increasing age and there was no marked sex difference until the age 13 to 15 years was reached, when values for boys were significantly lower than for girls; this sex difference continued in the higher age groups. Values for vitamin A for the whole survey showed no age or sex difference but some did exist for the same age and sex groups in different States. The greatest number of low values appeared in the 13 to 15 age group for both sexes; nearly 10 per cent. of the subjects of that age had values below 20 μg . per 100 ml. blood. Differences in carotene content were less consistent but it was again the 13 to 15 age group that showed most low values, with the males tending to be affected to a greater extent than the females. Data for alkaline phosphatase were collected at only 2 centres. In both sexes the mean value reached a maximum between 5 and 6 millimole units before puberty, and few values above 10 units were recorded. [A "millimole unit" is the activity liberating 1 mM nitrophenol per litre serum per hour from disodium *p*-nitrophenyl phosphate substrate.] After puberty

there was a marked decline in the value for girls, and the smaller decrease which occurred at this time in the boys gave rise to a distinct sex difference at 13 years and above.

The data are fully tabulated in 20 pages of the bulletin. For earlier papers in this series see Absts. 140, Vol. 22; 3430, 3391, Vol. 23, and preceding Abst.—D. Harvey.

2267

MOSER, A. M. **Menu patterns and food preferences in South Carolina.** *S. Carolina Agric. Exp. Stat. Bull.* No. 406, June 1953, pp. 49.

This report on the food habits of South Carolina people is based on an analysis of menus. About 400 city and farm men in 2 counties were interviewed and 149 farm families in the tobacco area were asked to keep records for 1 week of foods used and meals served.

The importance of regulating programmes for improved nutrition to local food patterns and preferences is stressed.—F. C. Aitken.

2268

DICKINS, D. and SHEETS, O. A. **Enrichment of whole ground corn meal in diets of farm-operator families.** *J. Amer. Dietetic Assoc.*, 1953, **29**, 873-877. [Dept. Home Econ., Mississippi Agric. Exp. Stat., State College.]

In a diet study of 429 farming families (Reagan and Crossman, *U.S. Dept. Agric. Information Bull.* No. 41, October 1951) 84 per cent. (361) consumed whole ground maize meal, 2.4 lb. per head, during the week of study. The intakes of vitamin B₁, riboflavin, nicotinic acid and Fe of most of these 361 families reached the levels recommended by the National Research Council. The proportions not reaching these levels were highest in the lower socio-economic groups. Enrichment of whole ground maize meal would have resulted in more families in these groups reaching the recommended allowances of the nutrients, especially of nicotinic acid.—F. C. Aitken.

2269

COLLAZOS C., C., WHITE, H. S., REH, E., HUENEMANN, R. L. and WHITE, P. L. **Dietary surveys in Peru. 1. San Nicolás, a cotton hacienda on the Pacific coast.** *J. Amer. Dietetic Assoc.*, 1953, **29**, 883-889. [Dept. Nutrit., Minist. Pub. Health, Lima, Peru.]

A representative sample of the population, 35 families, was studied for one week. Foods were weighed when possible. Nutrient intakes were computed from tables of composition of Peruvian foods (in the press) and were compared with recommended intakes derived from U.S. National Research Council, Instituto de Nutrición de Centro América y Panamá and FAO recommenda-

tions. Fifteen to 30 per cent. of the families had less than 75 per cent. of the recommended intakes of calories, protein, nicotinic acid and ascorbic acid. Half of the families had 75 per cent. or less of the allowances of vitamins A and B₁. Three-quarters of the families had less than 75 per cent. of the allowances of Ca and riboflavin.

Simple improvements in the diets could be effected by increased consumption of turnip greens, sweet potatoes and dried peas and beans. It is not possible to increase consumption of milk and milk products.—F. C. Aitken.

2270

LAL, S. B. **Consumption level of depressed classes (Nonia and Chamar) in Champaran (Bihar).** *J. Indian Med. Assoc.*, 1953, **22**, 492-495. [Pub. Health Lab., Patna.]

The diet of 50 Nonia families and 64 Chamar families, consisting of 242 and 347 persons, respectively, was surveyed. The method of study was described previously (Abst. 2571, Vol. 21). Consumption of foods and intake of nutrients per consumption unit are tabulated. The diets were considered to be adequate in energy but low in animal protein, Ca and vitamin A. Consumption of milk and milk products and of leafy vegetables was low.

Heights and weights of children were recorded; nutritional state was assessed and the percentages of boys and girls in different grades are shown. The incidence of xerophthalmia, phrynoderma, angular stomatitis and Bitot's spots in girls and boys is tabulated. There was little difference in nutritional condition between Nonia and Chamar children.—F. C. Aitken.

See also Abst. 2680.

GENERAL STUDIES: DIET PLANNING: EDUCATION

2271

HALDEN, G. **Harmonie alimentaire.** [Diet harmony.] *1^o Congr. Internazionale di Medicina Profilattica, Trieste*, 1951, 39-44. *Proc.*

2272

OBERT, J. C. and PATTON, M. B. **Appraisal of school lunch programs. 1. Developing a score card for management factors. 2. Changes in management practices after in-service training.** *J. Amer. Dietetic Assoc.*, 1953, **29**, 1004-1009; 1113-1117. [Inst. Nutrit. Food Technol., Ohio State Univ., Columbus.]

2273

DEN HARTOG, C. **Schoolvoeding.** [School meals.] *Voeding*, 1953, **14**, 492-504. [Voorlichtingsbur., Voedingsraad, The Hague.]

N.A. and R., April 1954

This is a review of school feeding, including notes on foods used, the extent of uptake and the clinical results, with special reference to what has been done in the Netherlands.—I. Leitch.

2274

La alimentación en los hospitales dependientes del Ministerio de Salud Pública de la Nación. 1. El regimen de la alimentacion normal. [**Diet in hospitals attached to the Ministry of Public Health. 1. Normal diet.**] *Inst. Nac. Nutricion, Argentina, Publicaciones Cientificas CNP.* 33, 1953, pp. 70.

To simplify the work in hospital kitchens, a normal basic dietary regimen has been established, in conformity with Escudero's recommendations, to meet the requirements of patients who are not in need of special diet treatment. The total energy value of this normal basic ration is 2600 Cal., and supplements are added for those with greater requirements. Tables give the quantities of each type of food required to make up the daily ration, the equivalents of other replacement foods and details of the variants used to raise the energy value to 2800 or 3000 Cal. Factors of correction are given for all the foods listed to show the quantities "as purchased". To provide variety in the menus, 8 different lists of foods complying with the requirements of the basic ration and brief indications of the method of cooking are given, and there is a plan to show the use of one of these listed diets.—M. B. Richards.

2275

ROBINSON, C. H. **Liquid diets.** *J. Clin. Nutrit.*, 1953, **1**, 476-477. [Dept. Food Nutrit., Drexel Inst. Technol., Philadelphia, Pa.]

2276

KOTSCHIEVAR, L. H., MOSO, A. and TUGWELL, T. **Utility and economy factors in using prefabricated meats.** *J. Amer. Dietetic Assoc.*, 1953, **29**, 878-882. [Dept. Institution Management, Teachers Coll., Columbia Univ., New York.]

2277

JACQUOT, R. and BIROLAUD, P. La levure aliment dans l'économie française. [**Food yeast in the economy of France.**] *IX Congr. Internaz. Indust. Agrarie, Rome*, May-June 1952, pp. 25. English and Italian summaries.

2278

BUCHER, K., MUMENTHALER, A. and WEISSER, K. Zur Frage der Verträglichkeit von Süßmost. [**Tolerance of unfermented grape juice.**] *Schweiz. med. Wochenschr.*, 1953, **83**, 735-739. [Pharmacol. Anst., Univ. Basle.]

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Studies were made on about 400 subjects of the effect of consuming large amounts of unfermented grape juice with reference to sensations in the mouth, stomach and intestine. On the whole the juice was well tolerated. About 6 per cent. experienced gastric discomfort, and from 6 to 15 per cent. complained of a sensation of fullness. In spite of the high energy value of the juice no effect on appetite was observed.—A. M. Copping.

2279

LEASE, E. J. **Corn meal enrichment.** *J. Amer. Dietetic Assoc.*, 1953, **29**, 866-872. [Nutrit. Dept., Clemson Agric. Coll., S. Carolina.]

The maize milling industry in the U.S. consists of a few relatively large mills which produce degermed maize meal and grits and some 8000 small mills which produce mainly whole maize meal. In 1943 South Carolina State Legislature enacted a law requiring the enrichment of all degermed maize meal and grits and requested small mills to enrich their whole maize products. This was followed by a programme of education and technical assistance until in 1949 it was possible to broaden the enrichment law to cover all maize products for use as human food in the State. Similar steps have been taken in some other states. The federal minimum enrichment standard for whole maize meal in mg. per lb. is: vitamin B₁ 2.0, riboflavin 1.2, nicotinic acid 16.0, Fe 13.0, Ca 500.0.—F. C. Aitken.

2280

SUR, B. K. and IYENGAR, N. V. R. **Wheat flour enrichment.** *Bull. Central Food Technol. Res. Inst. Mysore*, 1953, **2**, 267-269.

2281

MCCAY, C. M. **Nutrition in relation to aging.** *Gastroenterologia*, 1953, **80**, 193-203. [Cornell Univ., Ithaca, N.Y.] German and French summaries.

A lecture.

2282

TRÉMOLIÈRES, J. (with CLAUDIAN, J. and DESROCHES, H. C.) Contribution des enquêtes sociologiques sur l'alimentation à l'étude du comportement alimentaire de l'homme. [**Contribution of social studies on diet to the study of food behaviour in man.**] *Gegenwartsprobleme der Ernährungsforschung, Symposium, Basle*, October 1952, 13-35 (with discussion 36-38). Verlag Birkhäuser, Basle, 1953, Price Swiss fr. 32. [Sect. Nutrit., Inst. Nat. Hyg., Paris.]

- 2283
AYKROYD, W. R. **The nutrition work of FAO—current activities and problems.** *Gegenwarts-probleme der Ernährungsforschung, Symposium Basle*, October 1952. Verlag Birkhäuser, Basle, 1953, Price Swiss fr. 32. 285–298. [Nutrit. Div., FAO, Rome.]
- 2284
RAVINA, A. Le programme de nutrition des centres de santé au Vénézuéla. [**The nutrition programme of the health centres in Venezuela.**] *Presse méd.*, 1953, **61**, 1546–1547.
See Abst. 1024, Vol. 24.
- 2285
HOLLINGSWORTH, D. F. La profession de diététicienne dans le Royaume-Uni. [**The dietetic profession in the United Kingdom.**] *Bull. Soc. sci. Hyg. aliment.*, 1953, **41**, 81–88.
- 2286
HIRSCHEL-KONIJN, M. and DE WIT, J. C. L'enseignement de la diététique aux Pays-Bas. [**Teaching of dietetics in the Netherlands.**] *Bull. Soc. sci. Hyg. aliment.*, 1953, **41**, 89–93.
- 2287
VERDONK, G. Le premier enseignement officiel de la diététique en Belgique et son avenir. [**The first official instruction in dietetics in Belgium and its future.**] *Bull. Soc. sci. Hyg. aliment.*, 1953, **41**, 94–97. [State Univ., Ghent.]
- 2288
DEMOLE, M. and VÖGELIN, F. L'enseignement de la diététique en Suisse. [**The teaching of dietetics in Switzerland.**] *Bull. Soc. sci. Hyg. aliment.*, 1953, **41**, 98–101. [Fac. Méd., Geneva.]
- 2289
COSTA, D. Importance de l'enseignement de la nutrition. Son développement au Brésil. [**Importance of nutrition teaching. Its development in Brazil.**] *Bull. Soc. sci. Hyg. aliment.*, 1953, **41**, 102–112. [Fac. Nat. Méd., Univ. Brazil.]

FOOD ECONOMICS AND STATISTICS

- 2290
GHOSH, J. C. "**Planning for food and population.**" *Calcutta Med. J.*, 1953, **50**, 287–298.
A lecture.
- 2291
ORNSTEIN, J. Uitkomsten National Budgetonderzoek 1951. [**Results of the 1951 National Budget Investigation.**] *Voeding*, 1953, **14**, 553–556.
The first report on data from the National Budget Investigation deals with the expenditures of 1003 families of artisans, excluding agricultural labourers, in 1951. This extract deals with mean food expenditure of the whole group and families of 5 or more and of less than 5 persons, classified by residence in Rotterdam and The Hague, other towns of over 40,000 inhabitants and communities of less than 40,000. Food accounts on the average for 37 per cent. of total expenditure, more in large families, less in small, and less in Rotterdam and The Hague than in other urban communities. In comparison with data for 1935–36, there was some increase in consumption of green vegetables, fruit, milk and "genotmiddelen" [luxuries?].—I. Leitch.
- 2292
JOHNSON, H. A. **Urban use of Alaskan farm products.** *Alaska Exp. Stat. Bull.* No. 16, September 1953, pp. 20. [Palmer, Alaska.]
- 2293
LUCK, J. M. **Food prices in Palo Alto.** *Science*, 1953, **118**, 362–363. [Dept. Chem., Stanford Univ., Calif.]
For previous reports see Absts. 2599, Vol. 14; 4838, Vol. 18. Though the cost of a liberal diet has fallen considerably from the high figures of 1951 and 1952, in 1953 it still showed a percentage increase of 190 over that for 1939.
In future costings butter is to be replaced by fortified margarine and tinned salmon by tinned mackerel.—W. M. Deans.
- 2294
COOGAN, J. **Bread and the Soviet fiscal system.** *Rev. Econ. Statistics*, 1953, **35**, 161–167. [Russian Res. Centre, Harvard Univ.]
This detailed discussion, based on Soviet documents, includes a table of items in the cost of production of 95 per cent. extraction rye bread in Moscow for 9 selected years from 1934 to 1950 inclusive. In 1939 tax accounted for 68 per cent. of the retail price of bread, in 1947, 86 per cent. and in 1950, 70 per cent., and reasons are given for the author's belief that bread plays an even larger part in the Soviet fiscal system than is indicated by these figures or is admitted by Soviet authorities. Other data in roubles for 1939 and 1950, respectively, include procurement price of rye grain per 100 kg., 7.66, 9.66; value of 100 kg. rye flour before tax, 20.71, 27.11; retail price

of bread per kg., 1, 2.4. In 1950 milling costs were about $2\frac{1}{2}$ times, transport of flour 3 times and baking costs nearly 4 times as much as in 1939.—W. M. Deans.

2295

SKEOCH, L. A. **Food prices and ration scale in the Ukraine, 1946.** *Rev. Econ. Statistics*, 1953, **35**, 228-235.

The information, collected in the city of Kiev in June and July 1946, when the author was acting chief of the UNRRA Mission to the Ukraine, includes the widely differentiated ration scales for heavy workers, light and medium workers, office workers, dependents and children up to 12 years. Scientists and other privileged workers got much the same rations as heavy workers. The rations for fats and meat could not always be honoured, but children, heavy workers and pregnant and nursing mothers had high priority.

In addition to the ration stores selling at controlled prices there were government-controlled "commercial" stores selling unrationed delicacies

at high prices, and public markets selling surplus products of collective farms at prices several times those of the ration stores. Few people could afford to buy much from these two sources, but many resorted to them from time to time to break the monotony of the rations. During the period studied there was a sharp rise in the price of bread and cereals in the public markets owing to the poor harvest. There was, however, enough bread to meet the rations, though much of it was of rye, possibly with an admixture of coarse grains, and most of the wheat bread was of at least 85 per cent. extraction.—W. M. Deans.

2296

ELVIN, G. H. **Earnings and living standards in Moscow. A comment.**

SCHULZ, T. and WILES, P. **2. A rejoinder.** *Bull. Inst. Statistics Oxford*, 1953, **15**, 309-324; 315-326.

Criticisms of some of the data and methods used by Schulz and Wiles (Abst. 2163, Vol. 23) with a reply by the latter.—W. M. Deans.

DIET IN ETIOLOGY OF DISEASE

METHODS OF ASSESSING STATE OF HEALTH

See Abst. 1951.

GENERAL STUDIES

2297

KERPEL-FRONTUS, E., VARGA, F. and KOVÁCH, S. **The pathogenesis of infantile athrepsia.** *Ann. paediat.*, 1953, **181**, 129-146. [Dept. Paediat., Univ. Pécs.] German and French summaries.

From observations of the circulation and metabolism of 57 undernourished infants, it appeared that athrepsia (marasmus) occurred when a previously wasted baby became dehydrated. The sequence then was low water content of blood, severe decrease in cardiac output, sub-acute circulatory failure, and a further decline in cellular metabolism. The dehydration was usually due to infective gastro-enteritis in infants who were already underfed, diseased or congenitally deformed.—M. S. Fraser.

2298

FRY, P. C. **A comparative study of "obese" children selected on the basis of fat pads.** *J. Clin. Nutr.*, 1953, **1**, 453-468. [Forsyth Dent. Infirmary Child., Boston, Mass.] Spanish summary.

The 39 obese children were selected from 414 children, aged from 4 to 14 years, taking part in a growth study. Those selected had pads or folds of fat in at least 2 of the 3 regions, dorsal, abdominal and trochanteric. Fifty children were selected at random as a control group.

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For the 2 groups data were obtained on blood pressure, height, weight, tooth eruption, wrist ossification, mother's weight gain in pregnancy, weight at birth, ages of teething, walking and talking, rate of advancement towards puberty, protein and energy intakes, family stability, ethnic origin, birth order, illness experience, play activity and personality and habits. The data were analysed statistically.

The results indicated that the obese group tended to be advanced in skeletal development, did not overeat and were not especially prone to illness or accident.—F. C. Aitken.

2299

McCANCE, R. A. **Overnutrition and undernutrition. 1. Causes. 2. Effects.** *Lancet*, 1953, **265**, 685-690; 739-745. [Dept. Exp. Med., Med. Res. Council, Univ. Cambridge.]

A lecture.

2300

SIEDEK, H. **Magersucht. [Wasting disease.]** *Wien. klin. Wochenschr.*, 1953, **65**, 585-588. [I. Med. Klin., Univ. Vienna.]

A review.

2301

WALKER, A. R. P. and ARVIDSSON, U. B. **Iron "overload" in the South African Bantu.** *Trans. Roy. Soc. Trop. Med. Hyg.*, 1953, **47**, 536-548. [S. African Inst. Med. Res., Johannesburg.]

In an earlier note the haemosiderosis, then designated haemochromatosis, which is common in Africans was attributed to their high intake of Fe derived largely from iron cooking utensils (see Abst. 4125, Vol. 20). The evidence of a positive connection is examined in more detail and, from further consideration of these large amounts which are consumed, of other diseases likely to produce siderosis and of the incidence of siderosis in other parts of southern Africa, the conclusion that the condition is the direct result of the high intake is thought to be warranted. No evidence was found of haemosiderosis being associated with ill-health in any form.—D. Harvey.

2302

JAFFE, R. Consideraciones sobre la patología geográfica de Venezuela. [*Geography of disease in Venezuela.*] *Acta cientif. venezol.*, 1953, **4**, 86-88.

Arteriosclerosis is infrequent in Venezuela in comparison with European countries and occurs in only minor degrees. This is possibly associated with the low consumption of animal fat. Other relatively uncommon diseases are gallstones, diabetes, gout and rickets, though doctors are not agreed about the first three and there may be differences with social class. On the other hand, angina pectoris is as frequent as in England; but in Venezuela it is due to syphilitic aortitis. Myocarditis is common and may have a number of different causes, since the incidence is different in different parts of the country. Endocarditis and arthritis are infrequent. Essential hypertension seldom occurs among the poor but is as frequent among the well-to-do as in Europe. Thrombosis and embolism are almost unknown. Cirrhosis of the liver is much as elsewhere, but 2/3 of the disease is associated with bilharzia infection. There is nothing outstandingly different in intestinal disease.—I. Leitch.

2303

FREEMAN, J. T. *Clinical correlations in geriatric nutrition.* *J. Clin. Nutrit.*, 1953, **1**, 446-452. [Woman's Med. Coll. Hosp., Philadelphia, Pa.] Spanish summary.

DEFICIENCY DISEASES

General

2304

OOMEN, H. A. P. C. *Infant malnutrition in Indonesia.* *Bull. World. Health Organiz.*, 1953, **9**, 371-384. [Nutrit. Inst., Djakarta, Indonesia.] French summary.

A description is given of the commonly encountered infant malnutrition in Indonesia, based on a recent study of pre-school children in 2 towns. The most frequently observed signs of malnutrition

were emaciation, retarded growth, liver changes, dyspigmentation of hair and skin, other skin lesions, oedema, muscular wasting and hypochromic anaemia. Frequently associated with the general malnutrition syndrome was the more specific sign of vitamin deficiency, xerophthalmia, which responded to treatment with cod liver oil or vitamin A. Eight pictures of cases of kwashiorkor are shown to illustrate the text, but the term kwashiorkor is avoided in the paper because "the name kwashiorkor implies alterations in pigmentation which are not always present in undoubtedly related conditions".

Diet histories of 50 children aged 1 to 3 years showed that in the 2 weeks before examination 47 ate rice daily, 8 had sweet potato or cassava, 16 had eaten some green vegetable daily, 10 had eaten soya or green gram, 7 had been given small quantities of fish, meat or egg, 8 had had some fruit and 7 had been given condensed milk; 14 were still receiving breast milk.

Practical measures for treatment and prevention of malnutrition in Indonesia are indicated.

F. C. Aitken.

2305

DE SILVA, C. C., RAFFEL, O. C. and SOYSA, P. *Pattern of children's disease and death as seen in a children's hospital, Colombo, Ceylon.* *Acta paediat.*, 1953, **42**, 453-473. [Dept. Paediat., Univ. Ceylon, Colombo.]

The 3446 illnesses in 2168 admissions to hospital are classified as follows: intestinal parasites 1332, nutritional disorders 683, respiratory diseases 613, gastro-intestinal disorders, excluding intestinal parasites and amoebiasis, 510, nervous disorders 159, miscellaneous 149.

Among the nutritional disorders the most common were fatty liver, oedema and eye conditions such as xerophthalmia, Bitot's spots and keratomalacia. A pre-Bitot pigmentation and what the authors call a "gutter" pigmentation of the lower part of the sclera are described. Kwashiorkor was fairly common. There were 10 cases of rickets and 4 of scurvy which were diagnosed radiologically. Nutritional disorders had a fatality rate of 27.7 per cent.—F. C. Aitken.

2306

CHAUDHURI, K. C. *Nutritional disorders in children with special reference to oedema.* *Indian J. Pediat.*, 1953, **20**, 145-153. [Calcutta.]

2307

LAL, S. B. *Nutritional oedema and consumption level in yet another food scarcity area of Bihar.* *Indian Med. Gaz.*, 1953, **88**, 475-480. [Pub. Health Labs., Patna 4.]

The diet of 100 families was studied in 1951 in the district of Darbhanga. Food consumption

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and nutrient intake per consumption unit are tabulated with data obtained in a survey of the same families in 1943. There was serious deterioration in diet quantity and quality, except for Ca intake, which was greater in 1951 than in 1953.

Children and adults were examined clinically. Twenty-one subjects with oedema were found, all adult. The average bodyweights of men and women with and without oedema are presented. There was no statistical difference between those with oedema and those without. On the average both groups were much underweight. Data are presented for range and mean values of Hb, blood sp. gr., plasma sp. gr. and blood protein in 21 adults with and 23 without oedema. The values were not significantly different. Compared with values for normal healthy persons in other parts of the State, only blood protein was significantly lower.—F. C. Aitken.

2308

ALTMANN, A. **Kwashiorkor. Malignant malnutrition—infantile pellagra.** *S. African J. Clin. Sci.*, 1953, **4**, 71–89. [Baragwanath Hosp., Johannesburg.]

The author's published work on kwashiorkor is brought together and the results are reported of a follow-up study of certain of the patients previously examined. True relapse from which the patient might recover could occur; the shortest time before signs reappeared was 50 days. Twenty-two children were readmitted for study from 6 weeks to 2 years after the acute episode. All were in a satisfactory state of nutrition and had gained weight. In 2 patients only was the liver palpable more than 1 finger's breadth below the costal margin. Values for total serum protein were normal, the albumin values had increased slightly but were still below the lower limit of normal, and the γ -globulin values though lower than on discharge were still above the upper limit of normal. Liver biopsy showed small amounts of fat still present in 3 patients only. The response to some liver function tests had become normal but the findings were not consistent. In the acute episodes estimation of duodenal and faecal trypsin had given contradictory results, since the duodenal contents in 41 of 42 patients gave a positive reaction and in 25 of them on whom faecal tests were made the result was negative. Controls gave normal results. At the follow-up examination of 17 patients only three had a normal concentration of faecal trypsin, 2 had little and 12 had none. No explanation could be given.—L. Wills.

2309

VAN OYE, E. La courbe de Price-Jones dans la malnutrition et dans la dénutrition (kwashiorkor) en Afrique. [The Price Jones curve in

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malnutrition and in failure of nutrition (kwashiorkor) in Africa.] *Bull. Soc. Pathol. exot.*, 1953, **46**, 611–618. [Inst. Méd. Trop. Princesse Astrid, Léopoldville.]

Previous observation had shown that the Price Jones curve in healthy African infants was normal, and that the mean red cell diameter was 7.2μ , but that in apparently normal adolescent or adult Africans it showed 2 peaks, one at about 7.0μ and the other at about 8.0μ and, though the form of the curve varied in different individuals, these 2 peaks were always present. None of those studied was anaemic, but liver function tests have shown that in such apparently healthy subjects hepatic function was defective. The rare African with normal liver function was, however, found to have a normal Price Jones curve.

A study of the Price Jones curves in patients of all ages with kwashiorkor showed every curve to have 3 peaks, at about 7.0 , 8.0 and 9.0μ , though the actual shape of the curve varied in different individuals. At the same time the peripheral blood showed 3 types of red cell, normocytes, macrocytes and even larger cells for which there is no name, and which were thought to be derived from the intermediate erythroblasts known to be present as well as normoblasts and macroblasts in the bone marrow of such patients. The view is expressed that kwashiorkor is only the acute, final stage of pre-existent, chronic malnutrition, of which the first stage is associated with a dimorphic, and the last with a trimorphic, blood picture.

L. Wills.

2310

FRONTALI, G. "Kwashiorkor o distrofia farinacea"? ["Kwashiorkor or flour dystrophy"?] *Rev. española Pediat.*, 1953, **9**, 657–666. [Clin. Pediat., Univ. Rome.] French, English and German summaries.

A comparative study was made of kwashiorkor, as described in tropical regions of Africa, Asia and Central America, and "flour dystrophy", as it occurs in Italy, Germany, Spain and Greece in districts where supplies of milk are scanty. Apart from the depigmentation, which is prominent in the coloured races but less evident in the white, the clinical signs are similar in the two conditions; retardation of growth in height, rapid oscillations in weight due to fluid changes, dystrophic oedema not connected with renal or cardiac lesions, fermentative dyspepsia with reduced amylolytic capacity, hepatic steatosis, and reduction of blood protein with inversion of the albumin:globulin ratio. The condition is found in rapidly growing subjects, particularly in infants at weaning, when the diet is predominantly farinaceous and lacking in animal protein. In patients with flour dystrophy studied by the author the accompanying signs of different vitamin deficiencies could, without effect

on the general picture, be eliminated by giving the appropriate nutrient. The general condition improved rapidly after the giving of animal protein as skimmed milk, Finkelstein's albuminous milk, or transfusions of plasma.—M. B. Richards.

2311

CAUSERET, J. Les vitamines dans l'alimentation humaine. [Vitamins in human nutrition.] *Bull. Soc. sci. Hyg. aliment.*, 1953, **41**, 133-148. [Inst. Nat. Recherches Agronom., Paris.]

2312

DE FRANCISCIS, P. and LAMPITELLA, P. Rapporti dietetici nelle collettività manicomiali. [Reports on the diet in mental institutions.] *Boll. Soc. ital. Biol. sper.*, 1953, **29**, 260-263. [Ist. Fisiol., Univ. Naples.]

It had been found previously that the concentrations of pyruvic and lactic acid were abnormally high in the cerebrospinal fluid of mental patients because of insufficient intake of vitamin B₁ (Abst. 4056, Vol. 21). A survey was therefore made of the diet of 1000 patients in the Psychiatric Hospital of Aversa on 84 days, representing one week each month for a year. The average daily consumption of 30 foods is tabulated with a computation of the nutrients. The average diet supplied daily Cal. 2458, fat 48.5 g., carbohydrate 412 g., protein 87 g., Ca 0.67 g., P 1.1 g., Fe 47 mg., vitamin A 3123 I.U., vitamin B₁ 919 µg., riboflavin 964 µg., and vitamin C 37.5 mg. The diet was improved, especially in vitamins, and 3 months later estimation of pyruvic and lactic acids in the blood and cerebrospinal fluid of 10 of the patients yielded values which were normal or much more nearly so than had originally been found.—E. M. Hume.

2313

HARRIS, L. J. Vitamins and their practical significance in relation to national health policy, with special reference to British experiences in the war and since. *Gegenwartsprobleme der Ernährungsforschung, Symposium, Basle*, October 1952, 174-186 (with discussion 187-194). Verlag Birkhäuser, Basle, 1953. Price Swiss fr. 32. [Dunn Nutrit. Lab., Univ. Cambridge.]

2314

NICOL, B. M. Tribal nutrition and health in Nigeria: a comparative clinical study of primitive and urban nutrition. *J. Clin. Nutrit.*, 1953, **1**, 364-371. [Colonial Med. Serv., Nigeria.] Spanish summary.

This is a re-statement of the findings for farmers, fishermen and traders in Southern Nigeria (see Abst. 2795, Vol. 22).—F. C. Aitken.

See also Absta. 1931, 2118.

Vitamin A

2315

STUDNITZ, G. v. Zur Steigerung der Dunkeladaptation durch Helenien und Vitamin A-Emulsionen. [Increase in dark adaptation by means of helenien and vitamin A emulsions.] *v. Graefes Arch. Ophthalmol.*, 1953, **154**, 137-141. [Bad Schwartau.]

The failure of Gleys *et al.* (Abst. 3467, Vol. 23) to confirm that helenien and vitamin A improve dark adaptation is criticised on several grounds, among others that the number of volunteers examined was small and the apparatus used inadequate.

T. Moore.

2316

HAUBOLD, H., LOEW, W. and KOLB, E. Einwirkung von Penicillin auf den Vitamin A-Gehalt des Serums sowie auf die Nachsichtigkeit. [Action of penicillin on the vitamin A content of the serum and on night vision.] *Münch. med. Wochenschr.*, 1953, **95**, 792-796. [St. Pauls-Platz 9, Munich 15.]

Vitamin A was estimated in the blood serum of 5 healthy men aged from 25 to 53 years before and after from 2 to 4 injections of Procaine penicillin, totalling from 800,000 to 1,600,000 I.U., and in the blood of another 5 after 5 injections within 2 days of 200,000 I.U. pure penicillin. The serum value for vitamin A fell rapidly from normal values of well over 100 I.U. per 100 ml. to values below 70 and sometimes as low as 30. In young subjects the value soon tended to rise again without assistance but, usually, as soon as the result was established, the subject received from 50,000 to 600,000 I.U. vitamin A, which restored the blood value and relieved the diarrhoea, circulatory disturbances and feelings of fatigue and incapacity which had been produced in the older subjects. A few subjects with abnormally low blood values were tested, but no fall occurred with penicillin.

In some of the subjects dark adaptation was tested by the method of Engelking and Hartung, and was found to deteriorate after administration of penicillin.—E. M. Hume.

2317

LAURENCE, P. A. and SOBEL, A. E. Changes in serum vitamin A level during the human menstrual cycle. *J. Clin. Endocrinol.*, 1953, **13**, 1192-1200. [Dept. Biochem., Jewish Hosp., Brooklyn 16, N.Y.]

Vitamin A was estimated daily by chemical methods in the blood serum of 6 women who had no history of menstrual disorder. Three of the women were given massive doses of vitamin A some weeks before the observations were started. In 2 of them estimations were made during only one menstrual cycle, in 3 during 2 cycles, and in one

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during 6 cycles. The value for the vitamin tended to be low, average 30 $\mu\text{g.}$ per 100 ml., during menstruation and to rise to a maximum value of 75 on the 14th day of the cycle, and again to 70 on the 25th day. The preliminary treatment with vitamin A had no obvious effect on the serum values. In 2 subjects with abnormal menstrual cycles only irregular variations in the vitamin A were observed.—T. Moore.

2318

GRIESEMER, R. D., FRAZIER, C. N. and BLANK, I. H. **Nutritional influences on the physiology of the skin: observations on the metabolism of vitamin A.** *Medicine, Baltimore*, 1953, **32**, 293-321. [Dept. Dermatol., Harvard Med. Sch., Boston, Mass.]

Most of this interesting review is devoted to the general physiology of vitamin A. The topics covered include the measurement of vitamin A, its absorption, fate in the body, rate of utilisation, effect of stress on requirement, functions in the retina and elsewhere, relationship to thyroxine, deficiency in human beings, level in the blood serum, tolerance tests and vitamin A excess. Reference is made also to unpublished work at Massachusetts General Hospital on the value of vitamin A in the treatment of skin diseases. In agreement with previous claims by several workers, massive doses of vitamin A were found to be beneficial, but not completely curative, in Darier's disease and ichthyosis, but to be ineffective in acne vulgaris and psoriasis.—T. Moore.

2319

JAMES, W. H. and ELGINDI, I. M. **Effect of strenuous physical activity on blood vitamin A and carotene in young men.** *Science*, 1953, **118**, 629-630. [Dept. Agric. Chem., Louisiana Agric. Exp. Stat., Baton Rouge.]

Samples of blood for estimation of vitamin A and carotene were taken from 12 members of an athletic team before and after 50 minutes of strenuous physical activity and from 2 controls who remained seated during that time. The vitamin A in $\mu\text{g.}$ per 100 ml. ranged from 25.2 to 55.9 before exercise and from 43.7 to 69.1 after it. The values for the controls were 61.7 and 95.8 before and 73.3 and 92.0 after the same interval. The carotene values for those taking exercise ranged from 63.1 to 154.4 $\mu\text{g.}$ per 100 ml. before, and from 57.5 to 141.0 after, exercise. The corresponding day values for the controls were 94.6 and 143.4 before, and 109.3 and 133.7 after, the interval. The average increase in the vitamin A value during exercise was 47 per cent. with individual changes ranging from an increase of 106 per cent. to a decrease of 22 per cent. The average carotene

value decreased by 9 per cent. with individual changes ranging from +17 to -50 per cent.

R. J. Ward.

2320

GOUNELLE, H., TEULON, H. and CHEROUX, R. Absence d'action hypotensive de la vitamine A synthétique. [**Absence of hypotensive action of synthetic vitamin A.**] *C.R. Soc. Biol.*, 1953, **147**, 1018.

The fall in blood pressure which has been reported in hypertensive patients after the injection of synthetic vitamin A could be produced equally well by injection of the solvent used to carry the vitamin. It is presumed that the local reaction at the site of the injection provoked hypotensive activity in the adrenal glands.

T. Moore.

2321

DE LA PEÑA REGIDOR, P. Vitamina A en ginecología. [**Vitamin A in gynaecology.**] *Rev. clín. española*, 1953, **50**, 216-219. [Santa Cruz, Tenerife.] English, German and French summaries.

The use of very large doses of 200,000 I.U. vitamin A daily for 15-day periods was found useful in some patients with cystic glandular hyperplasia. Good effects were reported also from large doses of vitamin A in endometriosis and in menopausal and premenstrual disturbances. The general importance of vitamin A in gynaecology is suggested.—A. M. Copping.

2322

ORLANDI, E. Idrocefalo acuto da ipervitaminosi A. [**Acute hydrocephalus from vitamin A excess.**] *Lattante*, 1953, **24**, 332-334. [Clin. Pediat, Univ. Parma.]

The literature is summarised, in which 17 cases of acute hydrocephalus from excess of vitamin A are described. The dose was about 300,000 I.U. and toxic signs including a tense and bulging fontanelle could be seen after a single oral dose.

E. M. Hume.

Vitamin E

2323

POMERANZE, J. and LUCARELLO, R. J. **Tocopherol response curves and fat absorption.** *J. Lab. Clin. Med.*, 1953, **42**, 700-704. [Dept. Med., Med. Coll., New York.]

Tocopherol was estimated in the plasma of 12 normal adults on a diet low in fat, after fasting, and 3, 6, 9, 12, 24 and 48 hr. after a single dose of 1500 mg. tocopherol in an aqueous or an oily medium. In another experiment the tocopherol was given with a breakfast high in fat. Serum values after fasting ranged from 0.35 to 1.48 mg. tocopherol per cent. The maximum average value attained with aqueous dispersions was 2.5

mg. per cent. after 6 hr.; with the oily medium the maximum was 2.1 mg. after 12 hr. The maximum individual value observed with the aqueous medium was 3.11 mg. per cent. after 6 hr. and with the oily medium 3.08 after 12 hr. Subjects with a previously flat curve of response to tocopherol showed no additional response when fat was given, but those whose absorption was good responded with higher tocopherol values when fat was given. Subjects who had been on a low fat intake before and during the test period had low fasting values for tocopherol and the dose when administered in oil produced a very small response; absorption was better when tocopherol was given to them as an aqueous dispersion. Administration of the test dose with a fatty meal significantly increased the response in these patients.

R. J. Ward.

2324

GOUNELLE, H., MARNAY, C. and BLONDIN, M. L'épreuve d'hypervitaminémie chez le sujet normal. Différence d'absorption de l' α -tocophérol libre et de l'acétate de tocophérol. [Test of high blood vitamin value in the normal human subject. Difference in absorption between free α -tocopherol and tocopheryl acetate.] *C.R. Soc. Biol.*, 1953, 147, 1019-1021. [Centre Recherches Foch.]

When vitamin E was estimated in the blood of 15 normal human subjects before and 6 hr. after ingestion of 2 g. tocopheryl acetate the average increase was 36.3 per cent. When 11 patients without defective absorption were given 2 g. α -tocopherol alcohol the average increase was 118 per cent. In 5 subjects who were given first tocopheryl acetate and one month later free α -tocopherol the increases caused by the alcohol were 3 times as great as those caused by the acetate.

T. Moore.

2325

ROSENKRANTZ, H., MILHORAT, A. T. and FARBER, M. (with MAYRAN, M.) Intestinal absorption of vitamin E preparations in a patient with muscular dystrophy. *Metabolism*, 1953, 2, 556-561. [Dept. Med., Cornell Univ. Med. Coll., New York.]

A woman aged 38, with muscular dystrophy of the facioscapulohumeral type, was kept in hospital for a year as a volunteer for experiments on the absorption of α -tocopherol and its derivatives. There was no evidence that the absorption of these substances was impaired, and a sick subject was chosen only because no healthy person would willingly undergo the long stay in hospital. The diet was kept rigidly constant with a tocopherol content of 7.2 mg. daily, and supplementary amounts of 10 mg. natural tocopherols were provided continuously. During periods of 5 to 8 days additional massive doses of tocopherol or

derivatives were given, and the efficiencies of absorption were studied by examination of the faeces. Estimations were made by the ferric chloride method before and after refluxing the extract with HCl and stannic chloride, which had the effect of reducing and cyclising α -tocopherylhydroquinone into α -tocopherol.

When 3.0 g. tocopherol was given over a period of 8 days about 50 per cent. was recovered from the faeces. Only about 25 per cent. was recovered when 0.6 g. tocopherol was given over 6 days with a sorbitan fatty acid ester as emulsifier. Of amounts of α -tocopherylhydroquinone totalling 3 g. in 5 days about 50 per cent. was absorbed. The reading on the faecal extract was about 20 times greater after refluxing than before. Only about 15 per cent. of 1.0 g. of α -tocopherylhydroquinone diacetate, given over 7 days, was excreted, and the addition of the sorbitan emulsifier in a similar experiment reduced the excretion to 10 per cent. After large amounts had been taken tocopherol was passed in small amounts, not exceeding 0.9 mg. daily, in the urine.—T. Moore.

2326

NANO, H., GILBERT, N., SCENNA, M. and BARON, H. G. La vitamine E en ophtalmologie. [Vitamin E in ophthalmology.] *Ann. Oculist.*, 1953, 186, 987-994. [Serv. Ophthalmol., Policlin. Salaberry, Buenos Aires.]

Patients were given daily from 150 to 600 mg. *dl*- α -tocopheryl acetate for from 20 days to 6 months. Improvement was observed in 4 out of 7 patients with diffuse sclerosis of the choroid vessels, in 4 out of 7 with macular abnormalities, and in 9 out of 11 with degenerative myopia. The most prompt and impressive effects were seen in all of 5 patients with abnormalities of the papilla or retrobulbar nerve.—T. Moore.

Vitamin B Complex

2327

BLONDEL, A., CHUNG, D. V., NHI, N. T. and HUONG, B. Q. Le bérubéri au Nord-Vietnam. Les signes de début. [Beriberi in northern Viet Nam. Initial signs.] *Presse méd.*, 1953, 61, 1312-1314.

The onset of the classical signs of beriberi, polyneuritis, oedema and cardiac failure, is usually sudden and once developed they are often severe and resistant to treatment. Early diagnosis is therefore extremely important and is based on subjective and trivial symptoms, such as lassitude, asthenia, fatigability, palpitations, and occasionally "barre épigastrique" with violent pain which though rare is diagnostic when present. Slight changes in both sensory and motor functions may be present especially in the lower limbs. The

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most important objective sign is pseudohypertrophy of the calf muscles, which is concealed when oedema develops. Diagnosis is difficult but the immediate response to treatment with vitamin B₁ will confirm the clinical diagnosis.—L. Wills.

2328

BENCHIMOL, A. B. and SCHLESINGER, P. **Beriberi heart disease.** *Amer. Heart J.*, 1953, **46**, 245-263. [Hosp. Serv. Estado, Rio de Janeiro.]

Over 3 years, 22 cases of heart disease due to beriberi were seen; all the patients were men, all were heavy drinkers and only about half had a history of an associated dietary deficiency. Owing to the high energy intake from alcohol, all the patients appeared to be well nourished and with the exception of 6, all were engaged on very heavy work. Oedema of the lower extremities was the most constant finding and was the initial sign in 14 patients. Dyspnoea of varying degree occurred some time during the course of the disease; signs of pulmonary congestion were present in 19 patients. The signs and symptoms were indicative of left ventricular failure. Ascites was present in 5 patients and the liver was enlarged in all. Both pulse rate and blood pressure varied from patient to patient, and during the course of the disease transient bradycardia might occur during heart failure. Polyneuritis, never severe, occurred in 20 patients. In most of the patients X-ray examination showed enlargement of the heart but, unlike the findings in oriental cases, there was left ventricular enlargement as well as signs of pulmonary congestion, and in only 1 patient was right-sided enlargement predominant. On treatment with vitamin B₁ the size of the heart decreased and in most patients became normal. The electrocardiogram showed nonspecific abnormalities indicating myocardial damage; they cleared up after treatment with vitamin B₁.

L. Wills.

2329

EISEMAN, B. **Vitamin B₁ deficiency mimicking thrombophlebitis in the postoperative and postpartum period.** *Surgery*, 1953, **34**, 863-866. [Dept. Surg., Washington Univ. Sch. Med., St. Louis, Mo.]

2330

HAWTHORNE, B. E., WU, M. L. and STORVICK, C. A. **Thiamine metabolism of women on controlled diets. 3. Daily pyruvic acid values of whole blood.** *J. Clin. Nutr.*, 1953, **1**, 393-394. [Nutrit. Res. Lab., Sch. Home Econ., Oregon State Coll., Corvallis.] Spanish summary.

For previous parts see Abst. 2219, Vol. 23.

Estimations were made daily of pyruvic acid by the micromethod of Tsao and Brown (Abst. 1368, Vol. 20), and of vitamin B₁ in the fasting blood of

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4 women receiving a controlled diet containing for 7 days 500 µg. vitamin B₁ per 1000 Cal. and for 14 days 300 µg. per 1000 Cal.

In each woman, when the vitamin B₁ intake was decreased, there was an average increase of from 2 to 11 per cent. in blood pyruvic acid and a corresponding decrease of 11 per cent. in blood vitamin B₁. The changes were significant.—V. R. Jackson.

2331

TURNOCK, D. M. and WELBOURN, R. B. **The effects of glucose on blood pyruvic acid levels in mild thiamine deficiency.** *J. Lab. Clin. Med.*, 1953, **42**, 261-268. [Dept. Surg., Univ. Liverpool.]

Pyruvic acid was estimated by the method of Friedemann and Haugen (Title 16, Vol. 13) in the blood of 32 subjects suspected of mild or chronic vitamin B₁ deficiency. Subjects were fasted for 10 hr., which included an hour's rest, before receiving 100 g. glucose. Blood was taken after 1, 2 and 3 hr., all exercise and tourniquets being avoided.

The basal and peak values for pyruvic acid were normal in all but one subject, but some values failed to return to normal within 3 hr. There was no correlation between the pyruvic acid and blood glucose curves in the subjects concerned, and no undue secretion of adrenaline could be detected.

Eighteen subjects received 10 or 25 mg. vitamin B₁ 3 times daily for from 1 to 12 months and the effect on the blood pyruvic acid curve was compared with that for 20 subjects receiving no treatment. Vitamin B₁ had no effect on the basal value but did reduce the peak value and the extent to which the pyruvic acid value fell after the peak. The difference between the basal value and that reached after from 2 to 3 hr. tended to be greater in those not receiving the vitamin. It is concluded that failure of the pyruvic acid value to return to the basal level within 3 hr. represented a state of vitamin B₁ deficiency.

The test confirmed a clinical diagnosis of deficiency in 8 of 10 subjects, and gave evidence in 7 of 22 others where it was not expected.

V. R. Jackson.

2332

BORIĆ, D. **[Contribution to the solution of the pellagra problem and the pellagra picture in the Kosovo-Metohija region.]** *Serb. Acad. Sci., Monogr.* 208, *Sect. Med. Sci.*, No. 5, 1953, pp. 66. [Inst. Nutr., Serbian Acad. Sci., Belgrade.] In Serbian: English summary.

The Institute of Nutrition has been studying pellagra in the region of Kosovo-Metohija, which is racially and religiously varied and culturally backward. The food of the region is poor, largely maize bread, and pellagra is endemic. The traditional food habits are deeply rooted. In the years

1949-52, 4443 persons were examined and 1185 had pellagra. Men, women and children, and the two races, Serbs and Shiptars, are affected, Shiptars more often than Serbs. Adults fall ill most usually between 40 and 50 years of age, children between 10 and 15 years. The average daily intake of protein is 50.8 g., with 15.8 g. of animal origin. The disease is often chronic and not severe, without mental changes, but there are patients who are mentally affected. Signs of other deficiencies, such as pericorneal injection and hemeralopia, may be present also, and the author considers that riboflavin deficiency frequently accompanies pellagra. Retardation of growth in children is serious. Anaemia and goitre occur. The typical changes are described and illustrated in 69 excellent plates, 27 of them coloured.

When treatment was given, it suggested that the deficiency was multiple. In the village of Prilike in another region where pellagra does not occur, the diet contains much maize, but the protein supply is much better. (From summary.)

E. M. Hume.

2333

DOTTA, F. and CAMPANA, C. Eliminazione urinaria di acido nicotinico, nicotamide e loro derivati N₁-metilati nell'uomo sano e nel ratto albino trattati con isoniazide. [Excretion in the urine of nicotinic acid, nicotinamide and their N¹-methylated derivatives in healthy man, and in the rat, treated with isoniazide.] *Acta vitaminol.*, 1953, 7, 189-193. [Ist. Clin. Med., Univ. Rome.] English, French, German and Spanish summaries.

Three normal male subjects, aged from 25 to 35 years, were maintained on a low ration of tobacco and a constant mixed diet with exclusion of coffee, chocolate and pulses. Isoniazide (isonicotinic acid hydrazide) was given in an oral dose of 4 mg. per kg. bodyweight daily for 12 days. Nicotinic acid and amide, and trigonellin by the method of Roggen, were estimated in the urine daily throughout and for 7 days beforehand and for 5 days afterwards. No consistent change occurred. The results were confirmed with rats.—E. M. Hume.

2334

ROSENTHAL, H. L., GOLDSMITH, G. A. and SARETT, H. P. Excretion of N¹-methylnicotinamide and the 6-pyridone of N¹-methylnicotinamide in urine of human subjects. *Proc. Soc. Exp. Biol. Med.*, 1953, 84, 208-211. [Div. Nutrit., Dept. Med. Sch. Med., Tulane Univ., New Orleans, La.]

Adult human subjects, aged from 25 to 57, were maintained on diets containing high proportions of maize or wheat as previously described (Abst. 856, Vol. 23), supplying daily from 4.3 to 6.0 mg. nicotinamide and from 180 to 230 mg. tryptophan.

In the urine N¹-methylnicotinamide and pyridone were estimated fluorimetrically, creatinine by the alkaline picrate method, and N by Kjeldahl's method.

The average daily amounts excreted were 2.9 mg. N¹-methylnicotinamide and 4.7 mg. pyridone. After an oral test dose of 50 mg. nicotinamide there was in the ensuing 24 hr. an average increase in excretion of 5.5 mg. N¹-methylnicotinamide and of 23.4 mg. pyridone. The increase in excretion of the former was rapid during the first 4 hr.; that of pyridone was slower and less was excreted in the first 4 hr. than in the following 20 hr.

Three normal women and 2 with pellagra received a diet containing twice as much nicotinamide and 5 times as much tryptophan as the diets described above, and, at intervals of 3 days, a test dose of 10, 25 or 50 mg. nicotinamide. The average daily excretion of the normal subjects on the basal diet was 4.2 mg. N¹-methylnicotinamide and 5.9 mg. pyridone, and of the pellagrous subjects 1.3 and 0.9 mg., respectively. After 10 mg. nicotinamide, normal subjects excreted slightly more N¹-methylnicotinamide and 5 mg. more pyridone; after the higher doses excretion of both increased significantly. In the pellagrins excretion of both substances was much less than normal after 10 and 25 mg., but after 50 mg. the values were like those of normal subjects.—V. R. Jackson.

2335

LORENZINI, R. and BENEDETTI, A. Sul contenuto di acido nicotinico, acido ascorbico e composti piridinici N₁-sostituiti di trasudati ed essudati. [Nicotinic and ascorbic acid and N¹-substituted pyridine compounds in transudates and exudates.] *Acta vitaminol.*, 1953, 7, 213-216. [Ist. Clin. Med., Univ. Modena.] German, French, English and Spanish summaries.

2336

IAKUSHEVA, I. V. Vliyanie nikotinovoi kisloty na kharakter pletizmograficheskoi krivoi. [Effect of nicotinic acid on plethysmograph curve.] *Klin. Med., Mosk.*, 1952, 30, No. 8, 78-81. [Kaf. Terapii Leningrad. Inst. Usovershenstvovan. Vrach.]

When nicotinic acid was given intravenously two phases could be distinguished, a short phase lasting up to 30 sec. during which the plethysmograph curve fell and its oscillation decreased, and a second phase lasting from 5 to 7 min. during which the plethysmograph curve rose again and there was increased oscillation. The results suggested that nicotinic acid acts on the central nervous system, particularly the vascular and respiratory centres. (From summary.)

W. Hughes.

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2337

KROTOVA, M. I. Lechenie nikotinovoi kislotoi narushenii slukhovoii funktsii y lits rabotayushchikh na shumnykh proizvodstvakh. [Treatment with nicotinic acid of disturbances of auditory function in persons working in noisy factories.] *Vestn. Otorinolaringol.*, 1952, No. 2. 35-38. [Kaf. Bolesn. Ukha. Gorlainosa. Voenn.-Morsk. Med. Acad.]

Thirty people, 28 men and 2 women, 26 of them between 30 and 50 years and 4 over 50, who worked in noisy factories were given a course of 3 injections of nicotinic acid weekly for 5 weeks (20 to 50 mg. according to the patient's reaction). Hearing improved in 22; no change was produced in the other 8. Of 20 who complained of noise in the ears, 2 observed that the noise had disappeared after the course and 6 that it had decreased; there was no change in the others. The general state of health improved during the treatment. The improvement in hearing was maintained 2½ months after the course. The beneficial effect of nicotinic acid is probably related to expansion of the blood vessels to the ear.—W. Hughes.

2338

PUTIGNANO, T. and RAMUNNI, M. L'azione dell'idrazide dell'acido isonicotinico sulla eliminazione urinaria di vitamine del complesso B. [Action of isonicotinic acid hydrazide on the urinary excretion of vitamins of the B complex.] *Acta vitaminol.*, 1953, 7, 194-196. [Ist. Clin. Med., Univ. Bari.] French, German, English and Spanish summaries.

In the urine of 10 patients with pulmonary tuberculosis, maintained on hospital diet, nicotinic acid, riboflavin and vitamin B₁ were estimated for 2 days before treatment, and on the 10th, 11th and 12th day during treatment with isonicotinic acid hydrazide, 5 mg. per kg. bodyweight. There was no change except with vitamin B₁, of which the amount excreted was considered to be slightly reduced by treatment, but the range was very great.—E. M. Hume.

2339

PUTIGNANO, T., RAMUNNI, M. and COLONNA, L. L'azione dell'acido para-amino-salicilico sulla eliminazione urinaria di vitamine del complesso B. [Effect of p-aminosalicylic acid on the urinary excretion of vitamins of the B complex.] *Acta vitaminol.*, 1953, 7, 217-219. [Ist. Clin. Med., Univ. Bari.] English, French and Spanish summaries.

In groups of 10 patients, mostly with tuberculosis, administration of p-aminosalicylic acid was followed by a small increase in the excretion of nicotinic acid and a decrease in that of vitamin B₁.—E. M. Hume.

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2340

WU, M. L., WARREN, E. and STORVICK, C. A. Riboflavin metabolism of women on controlled diets. *J. Nutrition*, 1953, 51, 231-239. [Nutrit. Res. Lab., Sch. Home Econ., Oregon State Coll., Corvallis.]

During periods of 34 and 30 days, 7 normal women aged from 24 to 44 received a controlled diet providing daily 2000 Cal. and 1.2 mg. riboflavin.

The average daily urinary excretion ranged from 315 to 467 µg. riboflavin, representing from 27 to 40 per cent. of the intake. In the second period there was a continual decrease in riboflavin excretion, which suggested that the food intake before this test period supplied more vitamin than the controlled diet. One subject showed peak levels of excretion after attacks of migraine.

Daily creatinine excretion ranged from 248 to 474 µg., but in the last 10 days of the second period values for 2 subjects fell below 200 µg. which, according to Aykroyd *et al.* (Abst. 2612, Vol. 19), was a sign of inadequate riboflavin intake. These 2 subjects were bigger than the others.

In µg. per 100 ml. the average content of total riboflavin in the serum was 3.21, range from 1.72 to 6.25, and of free riboflavin 1.41, range from 0.21 to 4.23. Average fasting values for 29 normal adults were 2.89 and 1.01.

Two weeks after the second period a test dose of 2 mg. riboflavin was given; free and total serum riboflavin reached a peak within an hour and fasting values were regained after 2 and 5 hr., respectively. The maximum urinary excretion was reached in 1 hr. and the fasting value in 5 hr.

V. R. Jackson.

2341

VILTER, R. W., MUELLER, J. F., GLAZER, H. S., JARROLD, T., ABRAHAM, J., THOMPSON, C. and HAWKINS, V. R. The effect of vitamin B₆ deficiency induced by desoxypyridoxine in human beings. *J. Lab. Clin. Med.*, 1953, 42, 335-357. [Dept. Int. Med., Coll. Med., Univ. Cincinnati, Ohio.]

Clinical signs of vitamin B₆ deficiency, including anorexia, nausea, listlessness, seborrhoeic dermatitis, cheilosis, conjunctivitis, glossitis, pellagra-like dermatitis and polyneuritis, appeared in 34 of 50 patients who voluntarily took from 50 to 500 mg. desoxypyridoxine daily with a normal hospital diet or with one lacking in the vitamin B complex. Blood studies were made on 18 patients; lymphocytopenia occurred at the time of development of severe skin lesions. Mild anaemia in 5 patients appeared not to be related to lack of vitamin B₆. Metabolism studies showed an abnormally high excretion of xanthurenic acid after administration of tryptophan, high urea excretion in fasting subjects, and raised blood urea after ingestion of alanine. All the metabolic changes were corrected

and the skin lesions were healed after administration of pyridoxine, pyridoxal or pyridoxamine. Application of ointment containing vitamin B₆ to the skin lesions cured the immediate skin condition and, if widely applied, it cured the general symptoms too.

The results demonstrate that man needs vitamin B₆, and a daily intake of from 2 to 3 mg. is suggested as sufficient for the normal requirement.

A. M. Copping.

2342

MAGGIONI, G. and ASSENSIO, A. M. Eliminazione urinaria di acido xanturenico dopo carico orale di triptofano in varie condizioni patologiche del bambino. [Urinary excretion of xanthurenic acid by children after oral administration of tryptophan in various pathological conditions.] *Arch. ital. Pediat. Puericolt.*, 1953, 16, 43-62. [Ist. Clin. Pediat., Univ. Rome.] French, English and German summaries.

The xanthurenic index of Chiancone (Abst. 2673, Vol. 21; Title 1192, Vol. 22) relates the amount of xanthurenic acid excreted in the urine to the amount of tryptophan given as a test dose. It should not exceed 1. High values are regarded as evidence of vitamin B₁ deficiency.

In the urine of 16 children with different diseases, aged from 39 days to 11 years, xanthurenic acid was estimated by a method depending on the green colour produced by it in presence of ferrous sulphate, after administration of a dose of tryptophan, usually of 50 mg. per kg. bodyweight. Six of the children excreted no xanthurenic acid after the test dose. In the remaining 10 the xanthurenic index ranged from 0.25 to 9.6, with only two values of less than 1. The size of the index bore no relation to the nature of the disease. On intramuscular injection of 50 mg. vitamin B₆ at the same time as the dose of tryptophan, xanthurenic acid disappeared from the urine of 9 of the children. In the tenth the index was reduced from 9.6 to 1.99.

E. M. Hume.

2343

NICHELE, G. and ROVELLI, G. Studi sui metaboliti del triptofano. 2. Ricerche sulla eliminazione urinaria di acido nicotinico e trigonellina nel bambino dopo prove di carico con triptofano e vitamina B₆. [Studies on tryptophan metabolites. 2. The urinary elimination of nicotinic acid and trigonellin in children after a test dose of tryptophan and vitamin B₆.] *Arch. ital. Pediat. Puericolt.*, 1953, 16, 129-150. [Ist. Clin. Pediat., Univ. Rome.] French, English and German summaries.

Nicotinic acid and trigonellin were estimated in the urine of 15 of the children in the experiment described in the preceding Abst. In the 48 hr.

after administration of tryptophan there was a marked increase in the amount of nicotinic acid and of trigonellin excreted by all except one child, a different child in each case. After administration of vitamin B₆ with the tryptophan to 12 of the children, the amount of nicotinic acid excreted was even greater in 8, but in 4, although there was an increase, it was less than with tryptophan alone. With trigonellin also, the response to tryptophan and vitamin B₆ was sometimes greater and sometimes less than to tryptophan alone. The amounts of nicotinic acid and trigonellin excreted did not seem to bear any relation to one another.

E. M. Hume.

2344

KOTAKE, Y. (Jr.) and TANI, S. Studies on xanthurenic acid. 3. Xanthurenic acid in the urine of diabetic patient. *J. Biochem., Tokyo*, 1953, 40, 295-298. [Biochem. Dept., Med. Coll., Wakayama.]

See Abst. 5013, Vol. 23.

2345

SPRAY, G. H. and WITTS, L. J. The utilisation of folic acid in anaemia and leukaemia. *Clin. Sci.*, 1953, 12, 385-390. [Nuffield Dept. Clin. Med., Radcliffe Infirmary, Oxford.]

The concentration of folic acid in the plasma and the amount excreted in the urine were estimated before and after an oral test dose of 1 mg. pteroylglutamic acid in a series of patients. The values were compared with normal values previously obtained by the same method. In hypochromic anaemia there was apparently normal utilisation of folic acid. The slightly but not significantly lower values in the plasma and urine of patients with haemolytic anaemia suggested the existence of an increased demand. The values were low in patients with pernicious anaemia and in one with scurvy. In leukaemia of both types most patients showed low values for folic acid in the plasma and urine, but in one patient with *polycythaemia vera* they were normal. Since there is no evidence of failure in absorption from the gut in leukaemia, it is suggested that utilisation is increased and that the present findings support the view that the same increase in utilisation occurs in untreated pernicious anaemia.

L. Wills.

2346

SPRAY, G. H. and WITTS, L. J. The utilisation of folic acid injected intravenously. *Clin. Sci.*, 1953, 12, 391-397. [Nuffield Dept. Clin. Med., Radcliffe Infirmary, Oxford.]

Folinic acid was estimated microbiologically and recovery tests showed the method to be satisfactory for folinic acid in plasma. The test dose consisted of 1 mg. folinic acid in 2 ml. normal saline and there were 5 normal subjects, 5 patients with un-

treated pernicious anaemia, 2 with subacute combined degeneration and 1 with steatorrhoea. In all subjects the folinic acid level was high 10 min. after the injection and there was no significant difference between the rate of disappearance from the plasma in normal and sick subjects. Patients with pernicious anaemia and the one with steatorrhoea excreted in the urine less than the normal subjects and the patients with subacute combined degeneration. The folinic acid space, *i.e.*, the total quantity of folinic acid in the body divided by the concentration in the plasma, was significantly greater 10 min. after the injection and greater but not significantly so 90 min. after the injection in the patients with pernicious anaemia and the patient with steatorrhoea than in the normal subjects. It is concluded from these findings that in pernicious anaemia there is an increased demand for folic acid and its derivatives, which was not demonstrable in the study of the plasma figures alone.—L. Wills.

2347

BEGEMANN, H., KEIDERLING and WALTER, F. Der Einfluss der Folsäure auf die Eisenresorption. [**Influence of folic acid on iron absorption.**] *Klin. Wochenschr.*, 1953, **31**, 881–883. [Med. Klin., Univ. Freiburg i. Br.]

Serum Fe was estimated before and 2, 4 and 6 hr. after an oral dose of 200 mg. Fe as ferrous sulphate. The tests were repeated from 4 to 10 days later when 5.1 mg. folic acid were given with the same dose of Fe. Folic acid alone in this amount had no effect on the serum Fe value in 2 subjects with normal initial values or of 3 with low initial values. In 7 subjects with normal values and normal gastric acidity, the addition of folic acid to the dose of Fe did not alter the height of the rise in the serum Fe value, but in 8 subjects with low initial values and normal gastric acidity there was some increase in Fe absorption, though the increase in the rise was not significant. In 13 subjects with low initial values and hypochlorhydria or achlorhydria, the difference was highly significant, the mean rise in those having Fe only being 101 μ g. per cent., and in those having folic acid as well 176. Similar tests in 4 other subjects showed that the use of folic acid with Fe produced a far greater rise than the same dose of Fe with ascorbic acid. The results are discussed.

L. Wills.

2348

GIRDWOOD, R. H. Folic-acid-excretion studies in the investigation of malignant disease. *Brit. Med. J.*, 1953, ii, 741–745. [Dept. Med., Univ. Edinburgh.]

Folic acid excretion after a test dose of 5 mg. given parenterally was estimated in a large number of patients with different diseases; an excretion

of less than 30 per cent. of the test dose, *i.e.*, of less than 1.5 mg. in 24 hr., was considered low. In patients without prolonged infection and with no evidence of malignant disease, the results of the test were normal except in those with large effusions or oedema, when the vitamin was present in the effusion fluid. Normal excretion occurred in some patients with malignant disease, but in a large number of them excretion was low; there was no correlation between the amounts excreted and the erythrocyte sedimentation rate or the degree of anaemia. Excretion was low also in some patients with long-standing infection. In patients with megaloblastic anaemia the results were variable.—L. Wills.

2349

THEDERING, F. and RIETHMÜLLER, H. U. Die Behandlung megaloblastischer Anämieformen mit einer Kombination von Vitamin B₁₂ und Formylfolsäure. [**Treatment of megaloblastic anaemia with a combination of vitamin B₁₂ and formylfolic acid.**] *Deutsch. med. Wochenschr.*, 1953, **78**, 1470–1474. [Med. Klin., Univ. Tübingen.]

On the theory that a dual deficiency may exist or develop in megaloblastic anaemia, a trial was made of a preparation containing vitamin B₁₂ and formylfolic acid, a product intermediate between folic acid and the citrovorum factor. Sixteen patients with pernicious anaemia were treated with the combined product in an initial dose containing from 60 to 90 μ g. vitamin B₁₂ and from 20 to 30 mg. formylfolic acid; the dose was repeated every 8 days until a full remission was obtained. In patients with neurological signs the dose was continued for up to 6 months and in severe cases the amount of vitamin B₁₂ was increased to 200 μ g. The mean maintenance dose was 79 μ g. vitamin B₁₂ and 26 mg. formylfolic acid monthly. Fourteen similar patients were treated with vitamin B₁₂ alone for comparison. Both treatments produced satisfactory clinical and haematological remissions and improvement in the nerve signs, but with the combined therapy the size of the mean dose of vitamin B₁₂ and the time required to produce a full remission were both less.

L. Wills.

2350

DESHMUKH, P. L. Crystalline penicillin in macrocytic anaemia. *Antiseptic*, 1953, **50**, 625–630. [Sassoon Hosp., Poona.]

Three patients with macrocytic anaemia, 2 showing megaloblastic anaemia in the bone marrow and histamine-fast achlorhydria, were given crystalline penicillin parenterally. Two showed rapid and satisfactory response; the third responded little to this treatment but promptly to vitamin B₁₂ and folic acid.—W. Godden.

2351

- FINCH, S. C. **Vitamin B₁₂ in medicine.** *Med. Clin. N. Amer.*, 1952, **36**, 1223-1237. [Evans Memorial, Massachusetts Mem. Hosps., Boston.]
A review.

2352

- GILLHESPY, R. O. **The treatment of pernicious anaemia and allied megaloblastic anaemias.** *Practitioner*, 1953, **171**, 648-652. [Haematol. Clin., Dudley Rd. Hosp., Birmingham.]

The haematological response to parenteral administration of crude or purified liver extracts or of vitamin B₁₂ and to oral administration of proteolysed liver was studied in 90 patients with pernicious anaemia. In most of them a satisfactory response was produced by any of the preparations, but some patients could not be maintained in a satisfactory haematological state by certain of the preparations but could by some other, and in certain patients proteolysed liver given orally was the only effective treatment. Megaloblastic anaemia after gastrectomy was successfully treated with liver extract or vitamin B₁₂ given orally, and that associated with pregnancy with folic acid or proteolysed liver given orally.—L. Wills.

2353

- GLASS, G. B. J. and BOYD, L. J. **Oral treatment of pernicious anemia with small doses of vitamin B₁₂ combined with mucinous materials derived from the hog stomach.** *Blood, J. Hematol.*, 1953, **8**, 867-892. [Dept. Med., Med. Coll., Flower and Fifth Avenue Hosp., New York.]

Oral treatment with commercial and other preparations of mucin from pig's stomach and vitamin B₁₂ in doses of less than 20 µg. produced varying haemopoietic responses which were sometimes excellent. Amounts as small as from 20 to 50 mg. of the mucin were fully active when given daily; large doses combined with 150 µg. vitamin B₁₂ given weekly also were effective. Boiling did not inactivate the material.—L. Wills.

2354

- HEINRICH, H. C. and LAHANN, H. **Der orale Vitamin - B₁₂ - Resorptions - Exkretionstest. Ein Beitrag zur biochemischen Differential diagnostik der Megaloblasten-Anämien. [Oral test of absorption and excretion of vitamin B₁₂. Contribution to the biochemical differential diagnosis of megaloblastic anaemias.]** *Deutsch. med. Wochenschr.*, 1953, **78**, 1475-1476. [Physiol. Chem. Inst., Univ. Hamburg.]

2355

- KLEINSORGE, H. and RÖSNER, K. **Über Beeinflussung der basophilen Punktierung der**

Erythrocyten durch Vitamin B₁₂. [On influencing the punctate basophilia of erythrocytes with vitamin B₁₂.] *Klin. Wochenschr.*, 1953, **31**, 880-881. [Med. Poliklin., Univ. Jena.]

2356

- FOY, H. and KONDI, A. **Treatment of megaloblastic anaemias. Relation of penicillin to vitamin B₁₂.** *Lancet*, 1953, **265**, 1280-1285. [Wellcome Trust Res. Labs.]

Response to treatment was studied in 25 Africans with typical megaloblastic anaemia; 16 responded to penicillin given orally or by intramuscular injection, 4 failed to respond to penicillin at all or to vitamin B₁₂ given orally, but responded to it given parenterally, and 4 failed to respond at all to penicillin or vitamin B₁₂ but responded to folic acid given orally. There was histamine-fast achlorhydria in the 4 who responded only to vitamin B₁₂ given parenterally, and in the 2 of them examined atrophic gastritis was found; they were considered to be suffering from pernicious anaemia. The findings and the relevant literature are discussed, and it is suggested that penicillin influences the biosynthesis and utilisation of intestinal vitamin B₁₂ but is inactive in the absence of intrinsic factor.

L. Wills.

2357

- MEYER, L. M., BECERRA-GARCIA, A., GOLDMAN, A. and STERN, P. A. **Oral administration of Co⁶⁰ vitamin B₁₂ to normal persons, patients with pernicious anemia, and subjects with various medical disorders.** *J. Appl. Physiol.*, 1953-1954, **6**, 263-268. [Third Med. Serv., Goldwater Mem. Hosp., Brooklyn, N.Y.]

After an oral dose of 1.0 µg. ⁶⁰Co vitamin B₁₂ the total faecal excretion of ⁶⁰Co, expressed as a percentage of the dose, ranged from 8 to 41 in normal subjects; repeat tests on the same subjects showed that an increase up to threefold might occur. Similar tests in patients suffering from a variety of medical conditions showed a range of from 11 to 100 per cent.; there was no relationship between the presence of free HCl in the gastric juice and the amount of ⁶⁰Co excreted in the faeces. Repeat tests showed the same wide variations as in normal subjects. In patients suffering from untreated or treated pernicious anaemia, the values ranged from 48 to 100 per cent.; the addition of 100 ml. normal gastric juice to the test dose reduced the excretion in 5 of 6 patients tested, but the addition of folic acid or intrinsic factor had a variable effect. The wide variation in excretion from subject to subject and in the same subject after repeated doses made it difficult to draw a definite conclusion from these and similar observations.—L. Wills.

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2358

GOLDBECK, H. and WEISS, C. Die B-Aktivität im Blutserum nach intravenöser Belastung mit Vitamin B₁₂. [Vitamin B₁₂ activity in the blood serum after intravenous administration of vitamin B₁₂.] *Klin. Wochenschr.*, 1953, **31**, 860-861. [2. Med. Klin., Univ. Hamburg, Eppendorf.]

Free and bound vitamin B₁₂ were estimated microbiologically in serum with *Euglena gracilis* as the test organism for periods of up to 5 days after a single intravenous dose of 90 µg. of the vitamin. In all subjects examined there was an immediate steep rise in the free vitamin content of the serum. In 3 healthy subjects 2 hr. after a rise of about 600 µg. per ml. the value for the free vitamin began to fall and had reached its initial value in about 72 hr. The value for the bound vitamin began to rise when that for the free vitamin began to fall, and 4 hr. later it was above the value for the free vitamin; it continued to rise for another 6 hr. and then fell gradually to its initial value in 144 hr. In 2 Fe-deficient patients there was a similar rise and fall in the value of the free vitamin but the rise was from a high initial value; the value for the bound vitamin remained almost the same throughout the test period. In 2 patients with leucosis and 3 with bronchial carcinoma the value for the free vitamin rose slightly from an initially very low value; within 3 hr. all the vitamin was in the bound form.—L. Wills.

2359

BECKER, B., LANG, C. A. and CHOW, B. F. Vitamin B₁₂ excretion and diabetic retinopathy. *J. Clin. Nutr.*, 1953, **1**, 417-423. [Dept. Biochem., Sch. Hyg. Pub. Health, Johns Hopkins Univ., Baltimore, Md.] Spanish summary.

Preliminary observation had suggested that the urinary excretion of vitamin B₁₂ after a test dose might be low in certain diabetics, so a controlled study was made. After a single intramuscular injection of 50 µg. vitamin B₁₂ the mean amount excreted was 9.6 ± 1.4 µg. by 6 healthy adults, 19.0 ± 2.1 by 22 diabetics with retinopathy and 4.2 ± 1.7 µg. by 13 diabetics without retinopathy. The differences between the 2 diabetic groups and between each of these and the non-diabetic group were significant. Further studies on a group of 11 diabetics with retinopathy showed that the intramuscular injection of from 100 to 200 mg. testosterone every 2 or 3 weeks produced in all of them a fall in the vitamin B₁₂ excretion. In rats given 1 µg. radio-active vitamin B₁₂, the urinary excretion of the vitamin after administration of 5 mg. cortisone daily on 6 days a week for 3 weeks was nearly double that of rats given 1 ml. saline instead of cortisone. In a similar experiment, other rats given 10 mg. testosterone subcutaneously

every day for 2 weeks showed no significant difference in their excretion from rats not given testosterone.—L. Wills.

2360

BAYNE, G. M. and BOGER, W. P. Vitamin B₁₂ supplementation of the diet of healthy adults. A study of weight changes employing a Latin square design. *J. Clin. Nutr.*, 1953, **1**, 424-429. [Dept. Res. Therap., Norristown State Hosp., Pa.] Spanish summary.

A study was made of 44 physically healthy women under observation before discharge from a mental hospital. Every subject received each of 3 treatments for 3 months, and 3 groups were constituted receiving the treatments in varying order according to the Latin square design. The treatments were with 100 µg. vitamin B₁₂ once daily, 30 µg. vitamin B₁₂ three times daily or a dummy tablet. No significant weight gain was attributable to vitamin B₁₂ under the conditions of the test, and no difference appeared between periods in which 100 µg. was taken in tablet form or as an elixir in 3 separate doses of 30 µg. each. No evidence of the effect of vitamin B₁₂ on appetite was derived from the study. In spite of the negative results it is emphasised that, since vitamin B₁₂ is known to have important metabolic effects, it is advisable to include it in multivitamin preparations.—A. M. Copping.

2361

SCRIMSHAW, N. S. and GUZMÁN, M. A. Efecto de los suplementos dietéticos y de la administración de vitamina B₁₂ y aureomicina sobre el crecimiento de los niños de edad escolar. [Effect of dietary supplements and of the administration of vitamin B₁₂ and aureomycin on the growth of children of school age.] *Bol. Ofic. sanit. panamer.*, 1953, **34**, 551-562. [Inst. Nutric. Centro America y Panamá, Guatemala.]

A survey of schoolchildren aged from 7 to 11 years in urban and rural areas of El Salvador and Guatemala showed that those in the lower income groups were retarded in height and in weight in comparison with those of children in the United States. The diets were low in animal protein, vitamin A, Ca and riboflavin. A very high incidence of infestation with intestinal parasites was found. Supplements of animal or vegetable protein were given to groups of from 12 to 80 children in the form of ice-cream made from dried milk or soya bean milk. In comparison with children in the same areas having no supplement the additions had no significant influence on height and weight. Addition of vitamin B₁₂ or aureomycin with or without a protein supplement did, however, cause an increase in the coefficient

of height and weight increase. When these supplements were withdrawn, the growth rate was lower.

A. M. Copping.

2362

MALLARDI, A. Sull'impiego di aminoacidi, siero citossico, vitamina B₁₂ in lattanti distrofici, nati da madri tubercolotiche. Nota clinica. [Use of amino-acids, cytotoxic serum and vitamin B₁₂ in dystrophic infants of tuberculous mothers. A clinical note.] *Lattante*, 1953, 24, 307-320. [Preventorio Prima Infanzia Principessa Maria Pia di Savoia, Trani.]

Ten dystrophic children, aged from 4 to 19 months, offspring of tuberculous parents but not themselves affected, were given for 21 days an enzymic protein hydrolysate in an oral dose of 2 g. per kg. bodyweight daily. There was general clinical improvement with accelerated weight gain, more red cells and a higher percentage of Hb. Cytotoxic serum (anti-reticulo-endothelial serum, Citolisina (Sclavo)) was given to another 6 dystrophic children of the same type in 4 injections of 0.1, 0.2, 0.3 and 0.4 ml. at intervals of 4 days. Four were watched subsequently for about 3 months. Some improvement was observed and no adverse effect, but it is considered that the preparation should be used with great caution. Another group of 10 similar children received daily for a month a parenteral dose of 10 µg. vitamin B₁₂. Results were not dramatic but there was accelerated weight increase in all but 3 babies, with improvement in general condition, in number of red cells and in Hb percentage.—E. M. Hume.

2363

MEYER, L. M., SUAREZ, R. M. (Jr.), BUSO, R., SABATER, J. and SUAREZ, R. M. Oral administration of Co⁶⁰ vit. B₁₂ in tropical sprue and hepatic cirrhosis and diarrhoea. *Proc. Soc. Exp. Biol. Med.*, 1953, 83, 681-683. [Labs. Fund. Invest. Clin., Santurce, Puerto Rico.]

Under the experimental conditions 4 normal subjects excreted in the faeces from 31 to 78 per cent. of the ⁶⁰Co contained in a standard oral dose of 0.5 µg. ⁶⁰Co vitamin B₁₂ given fasting in 250 ml. water. In 5 with tropical sprue, 4 of them with free gastric HCl and one with achlorhydria, and in 1 with cirrhosis and diarrhoea, the excretion after the same dose showed a similar range; repeat tests either with addition of folic acid to the test dose or after administration of folic acid for different periods showed no consistent change in the excretion of ⁶⁰Co.—L. Wills.

See also Abst. 2421.

Vitamin C

2364

ŠILINK, K. Hyposaturační stavy při sezónních nedostatech vitamínu C a jejich škodlivost.

[States of unsaturation in seasonal deficiency of vitamin C and their undesirable effects.] *Čas. Lék. Čes.*, 1953, 92, 771-779. [Central Endocrine Inst., Prague.] Russian summary.

2365

BANERJEE, S. and BELAVADY, B. Dehydro-ascorbic acid level of blood in health and in typhoid fever. *Lancet*, 1953, 265, 912-913. [Dept. Physiol., Presidency Coll., Calcutta.]

Blood from 21 normal persons contained on the average, per 100 ml., 0.88 ± 0.03 mg. ascorbic acid and 0.09 ± 0.1 mg. dehydroascorbic acid. The figures for 41 persons with classical signs and symptoms of typhoid fever were 0.54 ± 0.06 and 0.27 ± 0.03 ; for 11 convalescents the values were 0.72 ± 0.001 and 0.16 ± 0.003 .—W. Godden.

2366

BRONTE-STEWART, B. The anaemia of adult scurvy. *Quart. J. Med.*, 1953, 22, 309-329. [Dept. Med., Univ. Cape Town.]

A study was made of 32 adult males, 31 of them Bantu, aged from 22 to 60 years, with typical scurvy; 13 of them were studied in detail. They were maintained on the diet on which they had developed scurvy and during periods of varying length different patients received vitamin B₁₂ parenterally, folic acid orally, Fe intravenously, vitamin B complex parenterally, and other substances such as cortisone in therapeutic doses; later each received 1000 mg. vitamin C daily, intravenously. Full diet was not given until the packed cell volume was over 40 per cent. In over 80 per cent. of the patients the mean cell volume was below 40 per cent. on admission and in most of them the anaemia was severe. The anaemia was generally normocytic and normochromic but in the severe cases it was macrocytic and in one it was megaloblastic. There was marked anisocytosis. The reticulocyte count might be raised and after rest in bed it rose. The platelet count, and the bleeding, coagulation and prothrombin times were within the normal range. The bone marrow was hypercellular but mitotic figures were reduced in number.

There was no response to the haemopoietic substances tested, but when vitamin C was given the bone marrow showed intense activity and the peripheral reticulocyte count rose. Histamine-fast achlorhydria and hypochlorhydria were common, but peptic activity was normal. Low plasma Fe and Fe-binding capacity were associated with the presence of haematomas, and increased excretion of pigment was related to extravascular haemolysis in haematomas. There was definite improvement in the scorbutic condition after rest in bed, but neither rest nor the administration of

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blood-forming substances produced any significant improvement in the blood picture.—L. Wills.

2367

MERSKEY, C. **Survival of transfused red cells in scurvy.** *Brit. Med. J.*, 1953, ii, 1353-1356. [Dept. Med., Univ. Cape Town.]

In 8 adult males, 7 Bantu and 1 Indian, with scurvy and normoblastic anaemia, and in 1 Bantu with scurvy but not anaemia, the survival time of transfused red cells was measured while the patients were at rest in bed on a diet lacking vitamin C. The survival time was reduced in 6 of the 9 patients; in 2 it appeared normal, but they were only observed for a short time, and in the remaining subject the transfused red cells disappeared rapidly after treatment with vitamin C. In the 6 patients with reduced survival time, administration of vitamin C caused an immediate reduction in the rate of destruction in 3, but in 2 the reduction occurred only after 2 or 3 days' treatment, and in the sixth patient, who had bled severely after administration of cortisone, the accelerated blood destruction continued for from 9 to 10 days after vitamin C treatment began. In a further study 3 very anaemic, scorbutic Bantu patients showed the same rapid destruction of transfused red cells; 6 less severely anaemic subjects had 1 pint of blood removed before receiving a transfusion of the same amount of blood, and here again the transfused cells were very rapidly destroyed in 4 anaemic and 1 non-anaemic patient, but in the one remaining patient, who was not anaemic, the survival time was normal. The addition of protein to the scorbutic diet did not alter the red cell survival time. The findings are considered evidence of the presence in these patients of a haemolytic process which must be important in producing the anaemia of scurvy.—L. Wills.

2368

AGATE, F. J. (Jr.), HUDSON, P. B. and PODBEREZEC, M. **Concentration of ascorbic acid in human adrenal cortex before and after ACTH administration.** *Proc. Soc. Exp. Biol. Med.*, 1953, 84, 109-112. [Dept. Anat., Columbia Univ.]

2369

CAJANDER, B. **Observations on a cortisone-like effect on injection of desoxycorticosteronacetate (DOCA) in combination with ascorbic acid in rheumatic diseases.** *Acta med. scand.*, 1953, 147, 53-59. [Dept. Med., Garrison Hosp., Boden, Sweden.]

A series of 65 patients with rheumatoid conditions, including 45 with classical rheumatoid arthritis, were treated with a total daily dose of 10 mg. desoxycorticosterone acetate and 2 g.

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ascorbic acid, given parenterally for 10 days; the treatment was repeated after from 7 to 10 days in some patients. The results varied but in 33 per cent. of the male, and 55 per cent. of the female, or 49 per cent. of all, with rheumatoid arthritis there was both subjective and objective improvement, and similar results were obtained in the other patients. The remainder were unchanged or deteriorated. Those who improved showed the greatest weight gain; the erythrocyte sedimentation rate rose in all patients who deteriorated and frequently fell in the patients who showed improvement. The differences in response were attributed to differences in hormone balance.

L. Wills.

2370

MARCOVICH, A. W. and MARCOVICH, J. F. **Diketogulonic acid and diabetes mellitus.** *J. Lab. Clin. Med.*, 1953, 42, 681-684. [Dayton, Ohio.]

A method is described for estimating diketogulonic acid, a breakdown product of dehydroascorbic acid, in blood. In 27 non-diabetic subjects no diketogulonic acid was demonstrated in the blood, but it was present in amounts ranging from 25 to 137.5 μ g. per 100 ml. in the blood of 4 diabetics controlled by diet alone, and in amounts ranging from 31.2 to 650 μ g. per 100 ml. in 24 diabetics controlled with insulin. There was no correlation between the amount of the acid and the value for the blood sugar. In some individuals there were wide variations in the diketogulonic acid value.—L. Wills.

2371

DHOPESHWARKAR, G. A. and MAGAR, N. G. **Availability of vitamin C in canned guavas.** *Ann. Biochem. Exp. Med.*, 1952, 12, 37-40. [Bio-Chem. Dept., Inst. Sci., Bombay.]

In agreement with earlier findings of Hartzler (Abst. 3646, Vol. 15) for guava juice, experiments with 2 young, healthy women and 6 men showed that vitamin C in canned guavas was as completely available as synthetic ascorbic acid.—W. Godden.

Other Vitamins

2372

GAMBLE, J. R., DENNIS, E. W., COON, W. W., HODGSON, P., MACRIS, J. A., WILLIS, P. W. III and DUFF, I. F. **The effectiveness of water and oil-soluble vitamin K preparations in correcting hypoprothrombinemia.** *J. Lab. Clin. Med.*, 1953, 42, 805-806. *Proc.* [Ann Arbor, Mich.]

2373

WITTE, S. and DIRNBERGER, P. **Klinische Untersuchungen über die Gerinnungsfaktoren, Prothrombin, Faktor V und Faktor VII bei**

16

Lebererkrankungen und ihre Beeinflussung durch Vitamin K₁ und Synka-Vit. [Clinical investigation of the clotting factors prothrombin, factor V and factor VII in liver diseases and the effects on them of vitamin K₁ and Synka-vit.] *Klin. Wochenschr.*, 1953, **31**, 781-787. [Med. Poliklin., Univ. Würzburg.]

2374

VAN DER BURG, A. P. J. **Changes in the capillary resistance.** *Acta med. scand.*, 1953, **146**, 448-456. [Dept. Med., Univ. Hosp., Utrecht.]

2375

HINES, L. E., CATLIN, J. and KESSLER, D. L. **Tests for so-called capillary fragility of the skin and the significance of positive tests in vascular disease.** *Amer. J. Med.*, 1953, **15**, 175-179. [Northwestern Univ. Dept. Med., Chicago, Ill.]

A negative pressure method was used for capillary fragility tests, which were made on skin in the interscapular region. Tests were positive in 2 of 102 healthy adults under 30 years of age and in 18 of 150 aged from 30 to 80, with normal blood pressure and no signs of vascular disease. In 46 patients with vascular disease but with normal blood pressure there were positive signs in 8, but in 116 patients with hypertension there were positive tests in half. In diabetics the percentage incidence of positive tests was 7 if hypertension was absent but 67 if it was present. In acute myocardial infarction there was no marked difference in the incidence of positive tests between patients with and without hypertension.

L. Wills.

2376

ROECKELEIN, R. Ein neues Verfahren zur Messung der Capillarresistenz. [New method of measuring capillary resistance.] *Klin. Wochenschr.*, 1953, **31**, 751-754. [Pathol. Inst., Univ. Bonn.]

The method depended on the production of petechial haemorrhages of the skin in the space within a small circular mouthpiece which was applied to the arm with a progressively increased pressure brought about by compression of a spring. Since the area of the skin affected was very small, repeated trials could be made until the exact pressure was found at which a visible haemorrhage was produced. Measurements were made on 165 healthy persons to establish a normal value for the pressure. The values ranged from 1400 to 2100 g.

E. M. Hume.

Vitamin D

2377

GAN, C. K. **Rickets and its incidence in Madhya Pradesh.** *Indian J. Pediat.*, 1953, **20**, 218-224. [Nagpur.]

In the years 1946-50, in the children's departments of the Mayo Hospital, Nagpur and of the Irvin Hospital, Armaoti, respectively, the total number of medical patients treated annually ranged from 5884 to 8224, and from 10,599 to 13,217, and the annual number with rickets ranged from 50 to 86, and from 25 to 167. The mean incidence was about 0.9 per cent.—E. M. Hume.

2378

THAMDRUP, E., FLENSBORG, E. W. and SMITH, T. **Housing conditions and rickets.** *Acta paediat.*, 1953, **42**, 483. *Proc.* [Copenhagen.]

2379

SEYSS, R. Die frühkindliche Wirbelsäule bei Rachitis. [The vertebral column of very young infants with rickets.] *Ztschr. Kinderheilk.*, 1953, **73**, 500-504. [Röntgenstat., Krankenhaus, Neunkirchen, Lower Austria.]

The author considers that the rachitic changes in the spine at a very early age have not received due attention. He gives a brief account of them with X-ray pictures of the spine from 3 infants of less than 3 months, before and after treatment with cod liver oil.—E. M. Hume.

2380

ACKERMANN, P. G. and TORO, G. **Effect of added vitamin D on the calcium balance in elderly males.** *J. Gerontol.*, 1953, **8**, 451-457. [Div. Gerontol., Sch. Med., Washington Univ., St. Louis, Mo.]

With the same methods except that for Ca, and with 6 of the same elderly men as were previously studied (Abst. 798, Vol. 24), balances of Ca and P were estimated. A comparison was made of results for Ca in food, urine and faeces obtained with the flame photometer and by a chemical method with precipitation of Ca as oxalate and titration with permanganate. The agreement was very good, and the flame photometer was used for the greater part of the study. Ca and P balances were measured consecutively during 60 days when no vitamin D was given, during 40 days when 25,000 I.U. were given daily, for 40 days in the course of 3 months when no vitamin was given, during 40 days when 600 I.U. daily were given, and during 60 days when 1800 I.U. daily were given. The complete schedule was not carried out with all subjects, particularly in estimations of P. The mean value for each individual for each period was calculated.

All the subjects were in negative Ca balance in the first period without vitamin D and all but one in the second. With 25,000 I.U. daily all were in positive balance or in equilibrium. With 600 or 1800 I.U. daily the results were not consistent, though the average Ca retention was increased.

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The P balance was estimated only for the dose of 25,000 I.U., and gave no consistent results.

E. M. Hume.

2381

KALoud, H. and STEUDTE, E. Vergleichende Untersuchungen über die Wirkung der peroralen Stosstherapie mit dem künstlichen Vitamin D₂ und dem natürlichen D₃ bei der Säuglingsrachitis. [Comparative action of single large oral doses of artificial vitamin D₂ and natural vitamin D₃ in infantile rickets.] *Öst. Ztschr. Kinderheilk.*, 1953, 9, 66-75. [Kinderklin., Univ. Graz.]

An X-ray photograph of the wrist and estimations of Ca, inorganic P and alkaline phosphatase in the blood serum were made before, and 6 or more days after, administration of a single oral dose of 15 mg. vitamin D₃ to 16 children with moderate or severe rickets or of vitamin D₂ to 9. The rate of healing of craniotables and the decrease in size of the fontanelle after 4 weeks were superior in the children given vitamin D₃. Other criteria showed no definite difference.—E. M. Hume.

2382

BURGSTEEDT, H., HILBER, H. and SCHEPPE, K. J. Ernährung und Diätetik. Pränatale Rachitisprophylaxe. [Food and dietary treatment. Antenatal prophylaxis of rickets.] *Münch. med. Wochenschr.*, 1953, 95, 938-941. [Kinderklin., Univ. Munich.]

Through the welfare centres of the city of Munich, 97 women, most of them in the fourth month of pregnancy, were given every other day a tin of condensed milk containing 1600 I.U. vitamin D. The distribution was continued until the baby was 3 months old; the mother was told to give it no other source of vitamin D until that age. The observations lasted 2 years from March 1950.

Of the 97 infants, 70 were without radiographic rickets in the first 3 months of life, while of 97 similar infants whose mothers had been untreated but were themselves given vitamin D, only 47 were without radiographic rickets in the first 3 months. It is therefore recommended that there should be antenatal as well as postnatal prophylaxis of rickets.—E. M. Hume.

2383

RUZICZKA, O. Klinische Untersuchungen bei Vitamin-D-Überdosierung. [Clinical investigation of vitamin D overdosing.] *Öst. Ztschr. Kinderheilk.*, 1953, 9, 4-21. [Kinderklin., Univ. Vienna.]

A full account is given of the clinical findings on 23 children who were the victims of an accident previously reported (Abst. 3528, Vol. 23). The children were treated with a high concentrate of vitamin D in the belief that it was cod liver oil.

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Three died. The intoxication varied in intensity according to age and the dose given; the signs and symptoms accompanying the different degrees of severity are tabulated.—E. M. Hume.

2384

KÖLBL, H. Serumchemismus bei der D-Hypervitaminose. [Serum chemistry in vitamin D excess.] *Öst. Ztschr. Kinderheilk.*, 1953, 9, 22-31. [Kinderklin., Univ. Vienna.]

The biochemical findings, including electrophoresis of the serum proteins, on 18 of the patients referred to in the preceding abstract are tabulated. They were obtained in the period after recovery had begun.—E. M. Hume.

2385

SWOBODA, W. Die Röntgenbefunde bei Vitamin-D-Überdosierung. [X-ray findings in vitamin overdosing.] *Öst. Ztschr. Kinderheilk.*, 1953, 9, 32-46. [Kinderklin., Univ. Vienna.]

The results are reported of X-ray examination of 13 of the same patients (see preceding Absts.). Calcification of the soft parts was confined to the dura mater and peri-articular regions.

E. M. Hume.

2386

BOLTZ, W. and WÖLKART, N. Über tödliche Vergiftungen durch Überdosierung von Fortedol (Calciferol). [Fatal intoxication by overdosing with Fortedol (calciferol).] *Öst. Ztschr. Kinderheilk.*, 1953, 9, 47-57. [Inst. Gerichtl. Med., Univ. Vienna.]

Of the 3 victims of the accident just described (see preceding Absts.) who died, one, 7 months old, succumbed to pneumonia 14 days after the first daily dose of 3 teaspoonsful of Fortedol (248,000 I.U. vitamin D per ml.). Only the liver and kidneys were available for examination. The kidneys showed severe pathological changes. The other 2 children were aged 20 months and 4 years. The bodies were exhumed, and decomposition was far advanced, but pathological changes in the kidneys and other signs made a retrospective diagnosis of vitamin D excess possible.

E. M. Hume.

2387

PATEISKY, K. Elektroencephalographische Untersuchungen bei Fortedol-(Vitamin D₂-) Überdosierung. [Electro-encephalographic investigation of overdosing with Fortedol (vitamin D₂).] *Öst. Ztschr. Kinderheilk.*, 1953, 9, 58-65. [Psychiat.-neurol. Klin., Univ. Vienna.]

It was possible to obtain an electro-encephalogram of only 3 of the victims of the vitamin D accident (see preceding Absts.). All were from one family. One had epileptic fits and 2 had attacks of cramp. Examination did not take

place until many months after the end of overdosing. The results for one child were within normal limits; for the other 2 they were profoundly abnormal. It is hoped in the future to examine more of the children.—E. M. Hume.

DENTAL DISEASES

2388

GABOVICH, R. D. and OVRUTSKII, G. D. O profilakticheskoi flyuorizatsii zubov. [**Preventive fluoridation of teeth.**] *Stomatologiya*, 1953, No. 2, 9-11. [Kaf. Obshch. Khim., Med. Stomatol. Inst., Leningrad.]

It has been shown experimentally by the application of 75 per cent. fluoride paste to the teeth of 7- to 14-year-old-children that it is sufficient to treat only one side of a tooth in order to protect against caries. This contradicts the theory that it is only that part of the tooth which comes into actual contact with the paste that benefits from the treatment. The modification used simplifies treatment and cuts down the time for rubbing on the paste by about half.—W. Hughes.

2389

HEYROTH, F. F. **Effectiveness and safety of fluoridation of public water supplies.** *Indust. Eng. Chem.*, 1953, **45**, 2369-2370. [Kettering Lab., Dept. Prevent. Med., Coll. Med., Univ. Cincinnati, Ohio.]

2390

HILL, I. N., BLAYNEY, J. R. and WOLF, W. **The caries experience rates of 12-, 13-, and 14-year-old school children after exposure to artificially fluoridated water for 59 to 70 months.** *J. Dent. Res.*, 1953, **32**, 654. *Proc.* [Zoller Mem. Dent. Clin., Univ. Chicago, Ill.]

2391

ZIEGLER, E. Cariesprophylaxe durch Fluorierung der Milch. [**Caries prevention by addition of fluorine to milk.**] *Schweiz. med. Wochenschr.*, 1953, **83**, 723-724. [Winterthur.]

The possibility of adding F to milk is suggested. It is stated to be simple and less expensive than addition of F to water supplies and to be capable of more direct application to groups specially susceptible to caries.—A. M. Copping.

2392

DEMOLE, V. Valeur diététique du fluor, son effet anticarie. [**Dietary value of fluorine; anti-caries effect.**] *Gegenwartprobleme der Ernährungsforschung, Symposium, Basle*, October 1952, 261-279 (with discussion 280-284). Verlag Birkhäuser, Basle, 1953. Price Swiss fr. 32. [Lausanne.]

2393

WILLIAMSON, M. M. **Endemic dental fluorosis in Kenya. A preliminary report.** *East African Med. J.*, 1953, **30**, 217-233.

A survey of the water supplies in Kenya showed a high fluoride content in many parts but especially in the south-western districts. Bore-hole, well and lake water had the highest F contents and the dust from the shores of Lake Nakuru contained 5600 p.p.m., of which 450 were soluble. The fluorides were derived mainly from weathered volcanic tuffs of tertiary origin. Examination of 4500 children and adults for dental fluorosis showed that all races were affected, but the incidence was highest in Asians and lowest in Europeans, 57.9 and 23.0 per cent., respectively, having mottled teeth. The need for further work is stressed. See Abst. 1148, Vol. 24.—L. Wills.

2394

NEVILL, L. B. and BRASS, W. **Preliminary report on dental fluorosis in Kenya European children.** *East African Med. J.*, 1953, **30**, 235-242. [Kenya Med. Dept.]

Examination of 1202 up-country European children aged from 7 to 14 years during 1952 showed that 30 per cent. had some degree of dental fluorosis and 40 per cent. had faulty teeth. The order of increasing incidence of dental defects closely paralleled that of decreasing incidence of fluorosis. The percentage of children with dental defects was 7 in those with mild fluorosis, 21.4 in those with moderate or severe fluorosis, and 50 in those with no sign of fluorosis. The highest incidence of fluorosis was in children drinking well or bore-hole water and the lowest in those drinking township or rain water; the incidence of dental defects was the reverse.—L. Wills.

2395

KAWAHARA, H. [Odontological observations on the fluorosis in Mt. Aso-volcano district. 2.] *Shikoku Acta Med.*, 1953, **4**, No. 1, 32-38. [Dept. Int. Med., Sch. Med., Univ. Tokushima.] In Japanese: English summary.

Drinking water from artesian wells in different villages in the district had F contents between 0.9 and 3.5 p.p.m. A positive relationship was found between the degree of mottling in the teeth of the children and the amount of F in the village water. Where the content was high signs of chronic fluorosis were present and there was a decline in the physique of the children. (From summary.)

W. Godden.

2396

HADJIMARKOS, D. M. **Dental caries among elementary school children in Oregon.** *J. Pediat.*, 1953, **43**, 393-397. [Dept. Foods Nutrit., Oregon State Coll., Corvallis.]

N.A. and R., April 1954

Earlier work in Oregon with children, 14 to 16 years of age, demonstrated their high degree of susceptibility to caries (Abst. 4043, Vol. 19). The present report concerns 1534 children aged from 5 to 12 years, the entire elementary school population of one town. Caries in deciduous teeth appeared in 78.0, 89.1, 88.7 and 88.7 per cent. of children at 5, 6, 7 and 8 years of age, respectively. In permanent teeth the incidence ranged from 34.4 per cent. at 6 to 98.6 per cent. at 12 years of age. The condition of first permanent molars was considered in particular, and these teeth were found to account for almost the entire DMF rate between 6 and 9 years and for half that at 12 years.

The findings show a higher incidence than has been reported from Maryland and Minnesota, and the need for further investigation of the cause is urged.—D. Harvey.

POISONS: PATHOGENIC ORGANISMS: FOOD LAWS

2397

ABRAMSON, E. **Chemicals in foods, and their control by the health authorities.** *Gegenwartsprobleme der Ernährungsforschung, Symposium, Basle, October 1952, 158-170 (with discussion 171-173).* Verlag Birkhäuser, Basle, 1953. Price Swiss fr. 32. [Nat. Inst. Pub. Health, Stockholm, Sweden.]

2398

Die Durchführung der Lebensmittelkontrolle in der Schweiz im Jahre 1952. [Legal control of foods in Switzerland in 1952.] *Mitt. Geb. Lebensmittel. Hyg.*, 1953, **44**, 407-441.

See also Abst. 2676.

IMMUNITY

2399

DANCIS, J., OSBORN, J. J. and JULIA, J. F. **Studies of the immunology of the newborn infant. 5. Effect of dietary protein on antibody production.** *Pediatrics*, 1953, **12**, 395-399. [Dept. Paediat., Coll. Med., Univ. New York.] Spanish summary.

For part 3 see Abst. 3351, Vol. 23.

The manner of immunisation and the titration of antitoxin response are described by Osborn *et al.* (*Pediatrics*, 1952, **9**, 736). Two groups of 10 infants under 3 weeks of age received artificial milk mixtures with protein levels of 2.0 and 3.6 per cent., respectively, protein providing 10 and 20 per cent. of the energy value. The infants were immunised either during the first week of life, at 1 month, or at 3 to 4 months of age.

There was no apparent difference in antibody response to diphtheria toxoid between the 2 groups. It is suggested that a high level of milk protein does not measurably improve antibody production.

D. Duncan.

2400

VEST, M. **Nahrungsmittelallergie, insbesondere Kuhmilchallergie bei Säuglingen. [Food allergy, especially cow's milk allergy in infants.]** *Ann. paediat.*, 1953, **181**, 277-294. [Kinderspital, Basle.] English and French summaries.

Full accounts are given of 9 infants with allergy to cow's milk and one with allergy to bananas. Leucocytosis was found, with a strong shift to the left, and later eosinophilia. The Prausnitz Küstner reaction was positive in only 2 cases. The result of investigations on antibody formation are reported separately in the next Abstract. In general the transition to soya feeding was easy and successful, except in one infant who was allergic to soya protein as well as to cow's milk and was given a diet of wheat germ, oats, vegetables and fruit, with Ossopan as a source of Ca. Until the allergy disappeared the child made excellent progress on this diet.

The introductory section of this paper, dealing with allergies, their diagnosis and treatment, contains 91 references.—M. B. Richards.

2401

BERGER, E. **Komplementbindende Antikörper gegen Nahrungsmittel bei Kindern. [Complement-fixing antibodies to foods in children.]** *Ann. paediat.*, 1953, **181**, 295-305. [Kinderspital, Basle.] English and French summaries.

By the complement fixation test it was shown that children can form antibodies against cow's milk, soya bean protein and oats. Positive results were obtained in 20 of the 84 children tested, a proportion smaller than that reported by other authors. Discrepancies are considered to be due primarily to differences in serological technique. The complement-fixing antibodies could be demonstrated in strong antigen concentrations, the "left" zone, and also in very dilute concentrations, the "right" or "eczema" zone. In several cases complement-fixing antibodies were present in children who showed no skin affection or other allergic sign. The term "eczema" zone should be used with reserve, since the manifestation of complement-fixing antibodies appears to depend on the serological technique, and the presence of antibodies in the "eczema" zone is not necessarily linked with the presence of eczematous conditions. Practical significance can be attached to the presence of complement-fixing antibodies only when other criteria support the diagnosis of an allergic disorder. Thus in one case of cow's milk allergy which was tested repeatedly at intervals of about 3 weeks, the disappearance of complement-fixing antibodies coincided with the point when tolerance of cow's milk was achieved.

Although the proof of antibodies has a limited diagnostic value, the results are of importance in nutritional physiology, in that they show that the proteins of cow's milk, soya bean and oats are not completely broken down in the gastro-intestinal tract, but are partially absorbed as such, and can lead to the formation of antibodies.

M. B. Richards.

2402

RATNER, B., UNTRACHT, S., MALONE, H. J. and RETSINA, M. **Allergenicity of modified and processed foodstuffs. 4. Orange: allergenicity of orange studied in man.** *J. Pediat.*, 1953, **43**, 421-428. [Dept. Paediat., New York Med. Coll.]

For previous parts, see *Ann. Allergy*, 1952, **10**, 675; 682; 690.

When a special brand of canned orange juice devoid of seed protein and peel oil, previously

investigated with guineapigs, was given by mouth to children who had been passively sensitised with serum from a patient highly sensitive to orange, no local reaction ensued, and the same was found when 2 oz. of the juice was given along with 1 ml. of a 1:100 dilution of orange seed protein. When another group of passively sensitised children were given 8 oz. of the same juice with 1 ml. orange peel oil, there was reddening and irritation about the mouth, and some had gastric discomfort, but none had local reactions. Six children sensitive to orange were able to take the special orange juice without any allergic reaction. From these experiments and injection tests it was concluded that orange seed protein does not readily traverse the gastro-intestinal wall, that orange peel oil is an irritant rather than an allergen, and that most cases of so-called allergy to orange arise from irritation by the peel oil.—W. M. Deans.

THERAPEUTIC AND PREVENTIVE DIETETICS

GENERAL

2403

RHOADS, J. E. **Supranormal dietary requirements of acutely ill patients.** *J. Amer. Dietetic Assoc.*, 1953, **29**, 897-903. [Harrison Dept. Surg. Res., Sch. Med., Univ. Pennsylvania.]

2404

ROBINSON, C. H. **Planning the high protein diet.** *J. Clin. Nutrit.*, 1953, **1**, 397-402.

In planning a high-protein diet attention should be paid to the quality of protein, energy value and palatability. A diet supplying 125 g. protein and 2800 Cal. is described. The protein content may be further raised by the addition of high-protein milk or egg-nog. Tables are given showing the nutritive value and cost of portions of food which are equivalent in protein content.—F. C. Aitken.

2405

PLOUGH, I. C., TESCHAN, P. E. and SELIGSON, D. **The toxic effects of modified human globin.** *J. Lab. Clin. Med.*, 1953, **42**, 224-231. [Dept. Hepatic Dis., Army Med. Serv. Grad. Sch., Walter Reed Army Med. Centre.]

2406

KYLE, L. H., HESS, W. C. and WALSH, W. P. **The effects of modified human globin in the human subject.** *J. Lab. Clin. Med.*, 1953, **42**, 459-467. [Dept. Med., Sch. Med., Georgetown Univ., Washington, D.C.]

2407

FROST, P. M. and SMITH, J. L. (with FELTS, J.) **Influence of potassium salts on efficiency of**

parenteral protein alimentation in the surgical patient. *Metabolism*, 1953, **2**, 529-535. [Surg. Serv., Wadsworth Hosp., Veterans Admin. Centre, Los Angeles, Calif.]

A study of 10 hospital patients who were given protein hydrolysate infusions with adequate additions of glucose and NaCl showed the necessity for addition of K also for optimum N retention. This replaced the loss of electrolyte caused by the breakdown of cellular protoplasm during the state of depletion. The amount of K required exceeded 5 m.equiv. per g. N infused.—M. B. Richards.

See also Absts. 1993, 2030, 2046, 2065.

DIABETES

2408

JACOBI, H. G. (with KAUFMAN, M. and OGATA, T.) **Nutritional standards, organization, and management of summer camps for diabetic children.** *J. Clin. Nutrit.*, 1953, **1**, 384-392. [111 E. 80th St., New York 21.] Spanish summary.

The organisation and management of a camp for diabetic children are outlined and the 5 basic diets used are given in some detail.—F. C. Aitken.

2409

GOODMAN, J. I. **Insulin (hypoglycemic) reactions in diabetic patients.** *Metabolism*, 1953, **2**, 485-499.

A review.

2410

OAKLEY, W. **"Lente" insulin (insulin zinc suspension): further studies.** *Brit. Med. J.*, 1953, **ii**, 1021-1023. [King's Coll. Hosp., London.]

2411

MURRAY, I. and WILSON, R. B. **The new insulins—lente, ultralente, and semilente.** *Brit. Med. J.*, 1953, ii, 1023–1026. [Dept. Metabol. Dis., Victoria Infirmary, Glasgow.]

2412

NABARRO, J. D. N. and STOWERS, J. M. **The insulin zinc suspensions.** *Brit. Med. J.*, 1953, ii, 1027–1030. [Med. Unit, University Coll. Hosp. Med. Sch., London.]

2413

GERRITZEN, F. **The classification of various insulins.** *Brit. Med. J.*, 1953, ii, 1030–1031. [Dept. Endocrinol., Univ. Hosp. Med. Dept., Leyden].

See also Abst. 2370.

GASTRO-INTESTINAL CONDITIONS

2414

CHAUDHURI, K. C. **Bio-chemical changes in diarrhoea of children, their interpretation and application in therapy.** *Indian J. Pediat.*, 1953, 20, 193–207. [Calcutta.]

Values for haematocrit, plasma CO_2 -combining power, serum and urine chloride are tabulated for 19 infants aged from 4 to 42 months, suffering from acute diarrhoea. All were previously malnourished. Eight died. In these haematocrit was high, CO_2 -combining power was low and serum and urine Cl were within normal limits. In non-fatal cases haematocrit was low, CO_2 -combining power was high and Cl levels were normal. In a second and third series of children with chronic diarrhoea, age ranged from $1\frac{1}{2}$ to 16 years and nutritional condition was fairly good. Values are tabulated for serum K in the second series of 18 children and for serum K and Na in the third series of 10 children. In general these values were within normal limits.

Treatment is discussed. In cases where there is fluid loss the first consideration is to re-establish fluid balance by administering adequate quantities of the appropriate repair solutions and simultaneously attempting to provide adequate calories and protein.—F. C. Aitken.

2415

KIRSNER, J. B., BRANDT, M. B. and SHEFFNER, A. L. **Diet and amino acid utilization in gastrointestinal disorders.** *J. Amer. Dietetic Assoc.*, 1953, 29, 1103–1108. [Frank Billings Med. Clin., Dept. Med., Univ. Chicago.] See Absts. 3294, 4587, Vol. 18; 3674, Vol. 19; 3760, Vol. 20; and Sheffner *et al.* (*Gastroenterology*, 1950, 16, 757).

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2416

ZARKHY, E. G. **Opyt lecheniya khronicheskikh kolitov rzhanyim khlebom.** [Treatment of chronic colitis with rye bread.] *Soviet. Med.*, 1952, No. 5, 45–46.

Rye bread given daily, 500 g. for 2 to 3 days, without administration of any drug, proved beneficial and produced a normal stool in patients suffering from intestinal disorders, such as diarrhoea.—W. Hughes.

2417

The sprue syndrome. *2nd Internat. Congr. Int. Med.*, 15–18 September 1952; *Acta med. scand.*, 1953, 146, 7–27 (with discussion 28–32). *Proc.*

THYROID DISEASE

2418

GREER, M. A. and ASTWOOD, E. B. **Treatment of simple goiter with thyroid.** *J. Clin. Endocrinol.*, 1953, 13, 1312–1331. [New England Centre Hosp., Boston, Mass.]

A historical review of the literature is given.

Fifty patients with non-toxic goitre were treated with thyroid in doses from $\frac{1}{2}$ to 6 grains, usually 2 or 3 gr., daily and were examined after intervals which varied from 1 week to 2 months. Forty comparable and untreated patients were also examined. Thyroid enlargement of 3 types, diffuse, multinodular or mononodular, was studied and patients were grouped into those in whom the enlargement disappeared, was reduced or showed no change. Of diffuse goitre 23 cases were treated and the numbers so classified were 10, 10 and 3; for 26 untreated cases the numbers were 4, 0 and 22. Of multinodular goitre 9 cases were treated and the corresponding numbers were 3, 3 and 3; for 6 untreated cases the numbers were 0, 1 and 5. Of mononodular goitre 18 cases were treated and the numbers were 7, 5 and 6; for 8 untreated cases the numbers were 1, 0 and 7. The response was more favourable in diffuse than in nodular goitre. Age was not of importance, nor was duration or extent of the enlargement, except that greatly enlarged glands tended not to regress completely.

It is stated that I therapy, though effective when the element is deficient or when a defect in the concentrating mechanism exists, may be ineffective when the defect is beyond that stage. Thyroid therapy, on the other hand, may reduce the size of the gland regardless of the nature of the defect. For that reason the infrequency of its use is surprising.—B. W. Simpson.

2419

MORREALE DE CASTRO, G., ESCOBAR DEL REY, F., MORA LARA, J. R. and ORTIZ DE LANDÁZURI,

E. Bases científicas que aconsejan el empleo de la sal iodada en la profilaxis del bocio endémico. [**Scientific bases for the use of iodised salt in prophylaxis of endemic goitre.**] *Rev. clín. española*, 1953, **50**, 285-289. [Clín. Méd., Univ. Granada.] English, German and French summaries.

Estimations were made of I and Ca in waters from 33 districts of the province of Granada. The data indicated a close relation between the I content of the water and the intensity of endemic goitre. Where goitre was prevalent, the I content was distinctly low, less than 0.3 μg . per litre in about 2/3 of the samples, while in regions free from goitre the values were from 1.0 to 1.5 μg . It is concluded that there is no obvious relation between the Ca content of the water and the presence or absence of goitre. In the authors' view the low I content of the water is an index of a total deficit in the diet, and they recommend the initiation of a campaign for the use of salt iodised with 5 to 20 mg. KI per kg.—M. B. Richards.

2420

KAMCHATNOV, V. P. Sravnitel'naya kharakteristika soderzhaniya margantsa v pishchevykh produktakh v endemicheskikh i neendemicheskikh po zobu raionakh. [**Relative characteristics of the manganese content of food products in endemic and non-endemic goitre regions.**] *Gigiena Sanit.*, 1953, No. 2, 33-35. [Kaf. Obshch. Gig., Kazan. Med. Inst.]

Manganese was estimated in oats, wheat, tomatoes, carrots, peas, potatoes and cabbages grown in 3 areas, where goitre is strongly endemic, weakly endemic and not endemic. Experiments confirmed that there is probably a relation between the Mn content and the vitamin C activity of the vegetables grown in these areas. There is a relation between Mn content and the distribution of goitre. Experimental and other published data indicate that high Mn and Fe contents and low I and vitamin C contents are conditions which favour the development of endemic goitre.—W. Hughes.
See also Abst. 2671.

ANAEMIA

2421

ADAMS, E. B. and WILMOT, A. J. **Megaloblastic anaemia of pregnancy and the puerperium.** *S. African Med. J.*, 1953, **27**, 1028-1032. [King Edward VIII Hosp., Durban.]

Severe typical megaloblastic anaemia occurred in 8 Indian and 6 African women in pregnancy or the puerperium. None of the women appeared malnourished, though all were poor and their diets were deficient in protein. Total serum protein was generally low and in 4 of 5 patients was below 5.5 g. per 100 ml.; after treatment it rose to

within normal limits, but if the albumin : globulin ratio was originally reversed, it remained so. No patient showed signs of involvement of the nervous system. Free acid was present in the gastric juice of 11 of 12 patients examined and serum bilirubin was normal except in 2 where it was slightly raised. One patient died of suppurative pyelonephritis, 9 patients were successfully treated with oral folic acid, 2 made good responses to parenteral vitamin B₁₂ and 2 to combined folic acid and vitamin B₁₂ therapy. In the discussion it is pointed out that no case of severe Fe deficiency in an African woman was seen during the year in which the megaloblastic patients were investigated and that in Indian women hypochromic anaemia appeared to be more common than megaloblastic anaemia during pregnancy and the puerperium.—L. Wills.

See also Absts. 2350, 2352, 2353, 2356, 2366.

OTHER CONDITIONS

2422

DOXIADIS, S. A., GOLDFINCH, M. K. and HOLT, K. S. **Alkalosis in infants. Treatment by intravenous infusion of ammonium chloride.** *Lancet*, 1953, **265**, 801-804. [Dept. Child Health, Univ. Sheffield.]

Aqueous M/6 ammonium chloride was infused at rates of from 0.5 to 1.5 ml. per min. into the scalp veins of 5 infants with pyloric stenosis and alkalosis and 2 hydrocephalic infants with normal acid base balance. The average fall in plasma CO₂ level was 0.43 m.equiv. per litre per ml. ammonium chloride infused per kg. bodyweight.

Infusion of ammonium chloride was preceded by intravenous infusion of saline-glucose or glucose solution, which prevented the study of renal response to ammonium chloride, but the diuresis in the 2 control infants was significantly greater than in the infants with alkalosis.

Generalised convulsions occurred in 2 infants with pyloric stenosis, but these were attributed not to ammonium chloride administration but to water intoxication.—F. C. Aitken.

2423

MOSES, C. **Prevention of arteriosclerosis.** *Geriatrics*, 1953, **8**, 534-544. [Addison H. Gibson Lab., Sch. Med., Univ. Pittsburgh, Pa.]

A review.

2424

ZINN, W. J. and GRIFFITH, G. C. **Atherosclerosis : a preventable disease?** *Med. Clin. N. Amer.*, 1952, **36**, 1001-1012. [Los Angeles County Hosp., Calif.]

2425

GEFTER, I. U. M., MILIUSHKEVICH, G. F., POSTNIKOV, B. N. and SHIT, A. I. A. [**Importance of**

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liberal protein diet in the treatment of severe burns.] *Khirurgiya*, 1953, No. 2, 25.

2426

MARSON, F. G. W. **Studies in gout, with particular reference to the value of sodium salicylate in treatment.** *Quart. J. Med.*, 1953, **22**, 331-346. [Dept. Therap., Univ. Birmingham.]

In the course of a detailed study of the possibility of mitigating chronic gout by keeping the serum uric acid down by prolonged administration of sodium salicylate, experiments with 8 gouty men who received alternate low-purine (lacto-vegetarian) and high-purine diets, supplying about 0.2 and 0.5 g. purine N, for from 7 to 11 days, confirmed the belief that the purine intake affects the serum uric acid value, the respective mean values being 6.4 and 7.7 mg. per 100 ml. It is considered, however, that a purine-free diet is unlikely to alter materially the clinical course of gout.

For 100 non-gouty adults, healthy subjects or hospital patients on a normal mixed diet, the mean serum uric acid values in mg. per 100 ml. were 4.54 ± 0.15 , S.D. 1.08 and 3.82 ± 0.14 , S.D. 1.00 for men and women, respectively.—W. M. Deans.

2427

CHYTIL, M., JAROŠOVÁ, V. and DAUM, S. **Rýžová dieta v léčbě hypertonické nemoci. [Rice diet in treatment of hypertension.]** *Čas. Lék. čes.*, 1953, **92**, 853-856. English and Russian summaries.

In 6 patients with hypertension, the use of a rice diet did not affect the blood pressure, visual fields or electrocardiogram any more favourably than a standard salt-free diet with which it was compared, and it had the disadvantage of being monotonous and ill tolerated by the patients. It depressed renal function. It had certain advantages for short periods for obese patients with high blood pressure. (From summary.)—E. M. Hume.

2428

GILL, R. J., DUNCAN, G. G. and REINHARDT, D. J. **Arterial hypertension: the therapeutic effect of sodium restriction combined with 1-hydrazinophthalazine or Dibenzyline.** *Amer. J. Med. Sci.*, 1953, **226**, 249-260. [Divs. Med., Pennsylvania Hosp., Philadelphia.]

2429

HARVALD, B. and ASTRUP, P. **Udvikling of "low salt syndrome" ved afvandingsterapi hos patienter med hjerteinsufficiens. [Development of "low-salt syndrome" in dehydration treatment of patients with cardiac decompensation.]** *Nord. Med.*, 1953, **50**, 1499-1503.

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[Blegdams Hosp., Copenhagen.] English summary.

Prolonged treatment of patients with cardiac decompensation with low-salt diet and mercurial diuretics leads to a characteristic state with thirst, anorexia, exhaustion, apathy, muscular weakness and giddiness. Renal function is reduced and blood urea rises. Blood Cl falls and finally also Na and K. NaCl is curative.

The etiology is discussed and the view is advanced that the mercurial drug stops tubular reabsorption of Cl, not of Na as is usually supposed. I. Leitch.

2430

FERGUSON, M. H. and KAY, L. A. **Sodium concentration in drinking water and other fluids and its significance in restricted sodium intake.** *Canad. Med. Assoc. J.*, 1953, **69**, 491-493. [Dept. Physiol., Fac. Med., Univ. Manitoba.]

Water from 63 of 165 samples taken from sources of public supply in Manitoba contained more than 100 p.p.m. Na; 13 contained more than 500 p.p.m. Beverages such as Coca-Cola and beer reflected the Na concentration of the local water supply. Water-softening processes considerably increased the Na content of the water. While the Na content of water and beverages is unimportant for the average adult, a litre of water containing 100 p.p.m. would contain half the daily allowance for a patient on a low salt intake of 200 mg. Na.—D. Duncan.

2431

KARE, R. M., HORWITT, M. K. and ROTHWELL, W. S. **Production and repair of experimental liver dysfunction in man by modifications of dietary protein.** *J. Lab. Clin. Med.*, 1953, **42**, 823. *Proc.* [Chicago, Ill.]

2432

KAWATA, H., OJI, K. and YOSHIDA, T. **Critical investigation of the amino acid treatment of liver cirrhosis.** *Med. J. Osaka Univ. (Engl. Ed.)*, 1953, **4**, 159-169. [I. Dept. Int. Med., Med. Sch., Univ. Osaka.]

Sixteen patients with moderate or advanced cirrhosis were given a diet providing 2500 Cal. and 1 g. protein per kg. bodyweight. An extensive series of investigations was made of clinical signs, blood composition, liver function and urine composition. Each patient was then given intravenously 200 ml. of 5 per cent. casein hydrolysate with 20 ml. of 2 per cent. methionine solution daily and after 4 weeks the examinations were repeated. The patients were classified in 2 groups of 8, in respect especially of diuresis and diminution of ascitic fluid, one with clinical improvement and the other with equivocal results. A detailed statistical analysis was made of the data.

From the data before treatment there was evidence that the groups differed mainly in respect of their metabolism of protein. After treatment it was found that the group which had improved clinically also showed improvement in liver function, but the other group showed no such improvement.—D. Harvey.

2433

SCHOUTEN, J. De toediening van zoutarm, geconcentreerd menselijk albumine bij ascites door levercirrhose. [Administration of low-salt concentrated human albumin in ascites due to cirrhosis of the liver.] *Nederland. Tijdschr. Geneesk.*, 1953, **97**, 2919-2925. [Gemeente-Ziekenhuis, Bergweg, Rotterdam.] English summary.

2434

ÖSTLING, G. Intravenös leverterapi. [Intravenous liver treatment.]

ADLERCREUTZ, E. Intravenös leverterapi vid levercirros. [Intravenous liver treatment of cirrhosis of the liver.] *Nord. Med.*, 1953, **50**, 1631-1634; 1634-1637. [OY Medica AB, Helsinki.] English summary.

Intravenous injection of certain crude liver extracts has produced great improvement in the progress of individual patients and a much higher general expectation of life in cirrhotics. The active component(s) is not known. It is not any of the usual lipotropic substances or B vitamins but is active in relatively small amounts and characteristically produces diuresis.

Case reports are presented and discussed.

I. Leitch.

2435

LEEVEY, C. M., ZINKE, M. R., WHITE, T. J. and GNASSI, A. M. Clinical observations on the fatty liver. *Arch. Int. Med.*, 1953, **92**, 527-541. [Dept. Med., Jersey City Med. Centre, N.Y.]

In 102 patients aged from 4 to 77 years in whom routine liver biopsy showed a fatty liver the proportion of fat in the section was from 10 to 30 per cent. in 30 patients, from 30 to 80 per cent. in 41 patients and over 80 per cent. in 31 patients. The most important cause was a diet poor in lipotropic factors, frequently associated with alcoholism. No correlation was shown between the degree or duration of the alcoholism and the severity of the steatosis. The presence of clinical disorders and abnormalities in liver function tests varied roughly with the degree of steatosis and improved when the fat was mobilised after treatment. There was no significant difference between the rate of mobilisation of the fat in patients receiving a high-protein diet and no other treatment and that in other patients receiving, as additions to the diet, vitamin preparations, choline,

methionine, vitamin B₁₂ or adrenal steroids, alone or in combination. Prolonged observations of 20 patients showed that in 9 who continued on a good diet with no alcohol there was no evidence of liver disease, but that of 11 patients who reverted to a poor diet with alcohol, 7 developed cirrhosis, 2 had mild fibrosis and 2 who had no fibrosis showed fatty infiltration. There was no significant change in the results of the liver function tests in those patients who developed cirrhosis.—L. Wills.

2436

RICKETTS, W. E. Acute and chronic hepatitis: diagnosis, course and management. *Med. Clin. N. Amer.*, 1953, **37**, 125-143. [Chicago, Ill.]

A review with 63 references.

2437

TOLSTRUP, K. On psychogenic obesity in children. 4. *Acta paediat.*, 1953, **42**, 289-304. [Gentofte, Denmark.] French, German and Spanish summaries.

This study is based on 26 girls and 14 boys with obesity and the same numbers of controls, all but one between 7 and 16 years of age, from Odense and its neighbourhood.

All but one of the fat children were or had been excessive eaters, especially of extra meals. Thirteen showed low bodily activity, but none of the controls did so. The local diet, rich in carbohydrate and fat, is itself likely to predispose to obesity. In 5 girls and 2 boys the excessive eating was definitely ascribed to psychological conditions, and in 4 girls and 2 boys these were thought to be probable the cause, but only 3 of the former group had the particular psychological background described by Bruch (for references and other Danish studies see Abst. 5116, Vol. 23).—W. M. Deans.

2438

MAYER, J. Genetic, traumatic and environmental factors in the etiology of obesity. *Physiol. Rev.*, 1953, **33**, 472-508. [Dept. Nutrit., Harvard Sch. Pub. Health, Boston, Mass.]

2439

PENNINGTON, A. W. Treatment of obesity with calorically unrestricted diets. *J. Clin. Nutrit.*, 1953, **1**, 343-348. [Med. Div., E.I. du Pont de Nemours and Co., Wilmington, Del.] Spanish summary.

2440

PENNINGTON, A. W. Obesity: overnutrition or disease of metabolism? *Amer. J. Digest. Dis.*, 1953, **20**, 268-274. [Med. Div., E.I. du Pont de Nemours and Co., Wilmington, Del.]

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Published data of energy balance studies are quoted to show that on the average during restriction of energy intake there is a decline in basal energy expenditure in the obese, a greater decline in normal subjects and no decline in normal subjects who have first increased their weight by overeating. It is suggested that obesity is frequently due to some metabolic aberration involving the regulation of fat storage. Since restricted energy intake may have harmful effects, the dietary treatment of choice is a low-carbohydrate regimen with meat and fat to appetite.—F. C. Aitken.

2441

KATTUS, A. A. **Recent developments in the therapy of edema.** *Med. Clin. N. Amer.*, 1952, **36**, 953-966. [Dept. Med., Sch. Med., Univ. California, Los Angeles.]

2442

WILSON, D. **A study of spinal osteoporosis.** *Proc. Roy. Soc. Med.*, 1953, **46**, 977-981.

In this address the approach is clinical. The quality of the diet of the 36 subjects was judged by verbatim questioning. Many of the patients were women and the disorder was of menopausal origin; in these, endocrine treatment, if instituted before vertebral collapse, was valuable. Osteoporosis of nutritional origin was alleviated only slowly by Ca and vitamin D in the diet.

D. Harvey.

2443

BOINES, G. J. **Nutrition in poliomyelitis.** *J. Clin. Nutr.*, 1953, **1**, 355-363. [Dept. Biol. Sci., Univ. Delaware, Newark.] Spanish summary.

Much importance is attached to the giving of a high-protein, high-energy diet from the very beginning of hospital treatment. To a routine hospital diet supplying 85 g. protein and 2220 Cal. daily is added a supplement of fat emulsion 4 oz., protein powder 2 oz., eggs 2, maize syrup 1 oz., milk 1 qt., which increases protein intake to 172 g. and energy intake to 3817 Cal. daily.

Capsules containing hesperidin and vitamin C are given daily.

It is believed that attention to nutrition in the management of poliomyelitis has resulted in superior clinical results.—F. C. Aitken.

2444

FOLBERTH, S. Speck—als kinderärztliches Therapeutikum. [**Lard in the treatment of children's diseases.**] *Deutsch. med. Wochenschr.*, 1953, **78**, 1564-1565. [Lörrach, Baden.]

Good results are claimed for treatment with finely divided lard, 5 g. cautiously increased to from 30 to 50 g. daily, added to the prepared feeds, of 4 young children with chronic eczema, 6 infants with *dermatitis seborrhoides* and at least 18 of 27 infants with *crusta lactea*; the last were enabled to revert to milk feeding.—W. M. Deans.

6. FEEDING OF ANIMALS

GENERAL, INCLUDING DIGESTIBILITY TRIALS

2445

JOHNS, A. T. **Ruminant metabolism.** *Proc. N.Z. Soc. Animal Prod.*, 1953, **13**, 106-110 (with discussion 111). [Grasslands Div., D.S.I.R., Palmerston North.]

2446

DAYUS, C. V. **Animal production, and some related problems, in Southland.** 1. 2. *N.Z. Vet. J.*, 1953, **1**, 87-92; 115-122. [Dunedin.]

2447

KEHAR, N. D. **The problem of animal nutrition and its bearing on human welfare.** *Proc. 40th Indian Sci. Congr., Lucknow*, 1953, pp. 20.

2448

VIRTANEN, A. I. **The basis of natural foodstuffs for nutrition.** *Gegenwartsprobleme der Ernährungsforschung, Symposium, Basle*, October Vol. 24, No. 2

1952, 39-51 (with discussion 52-53). Verlag Birkhäuser, Basle, 1953. Price Swiss fr. 32. [Biochem. Inst., Helsinki.]

2449

WALLACE, L. R. **The basic efficiency of animal production.** *Proc. N.Z. Soc. Animal Prod.*, 1953, **13**, 5-16. [Ruakura Animal Res. Stat., Hamilton.]

2450

HOHLS, H. W. Inwieweit ist die Lehmannsche Verwertungszahl als Mass-stab für die Futterausnutzung anzuwenden? [**How far can the Lehmann utilisation index be taken as a measure of efficiency of feed utilisation?**] *Arch. Geflügelk.*, 1953, **17**, 259-268. [Bundesforschungsanst. Kleintierzucht, Celle.] English summary.

A general discussion.

2451

HARDISON, W. A. and REID, J. T. **Use of indicators in the measurement of the dry matter intake of grazing animals.** *J. Nutrition*, 1953, **51**, 35-52. [Cornell Univ., Ithaca, N.Y.]

The use of Cr_2O_3 as an indicator for estimating the dry matter intake of grazing animals was studied in a comparison between steers receiving similar herbage grazed and hand-fed. The excretion of Cr_2O_3 at different times throughout a 24-hr. period and the effect of sampling at these times on the recovery of Cr_2O_3 were estimated. The pattern of excretion varied considerably between animals grazing and those being hand-fed twice daily. An estimate of dry matter intake calculated from a "grab" sample was accurate only when the pattern of excretion was known. As a result of these experiments samples taken from grazing steers at 6 a.m. and 4 p.m. were bulked on a wet weight basis and the amounts recovered represented on the average 99.95 per cent. of the Cr_2O_3 ingested.—D. M. Walker.

2452

LANCASTER, R. J., COUP, M. R. and PERCIVAL, J. C. **Measurement of feed intake by grazing cattle and sheep. 3. Marker technique for investigating the faeces output of grazing cows.** *N.Z. J. Sci. Technol.* [A], 1953, **35**, 117-126. [Ruakura Animal Res. Stat., N.Z. Dept. Agric., Hamilton.]

For previous parts see Absts. 133, Vol. 21 ; 2679, Vol. 23.

Chromic oxide was administered twice daily in gelatine capsules to 3 cows during a 40-day grazing period. Total collections of faeces were made and the recovery of chromic oxide was compared with representative samples twice daily or "grab" samples twice daily. Mean concentrations of chromic oxide in the night representative samples were about 12 per cent. higher than in the day samples. Grab sample means were much more variable.

Faeces output by individual cows over 5-day periods was estimated from individual grab sample data with an error of about 10 per cent. From the representative samples the amounts recovered during the period were estimated to be 102, 100 and 102 per cent. of the ingested Cr_2O_3 for the 3 cows.—D. M. Walker.

2453

RICHARDS, C. R. and REID, J. T. **The digestibility and interrelationships of various carbohydrate fractions of pasture herbage and a resolution of the components of crude fiber and nitrogen-free extract.** *J. Dairy Sci.*, 1953, **36**, 1006-1015. [Dept. Animal Husb., Cornell Univ., Ithaca, N.Y.]

Pasture of timothy and mixed grass was analysed at 3 stages of growth and the digestibility of the constituents was estimated with 2 groups of 3 bullocks, one group being given cut forage from areas adjacent to those grazed at the same time by the other group. Collection bags were used to collect all the faeces.

The method of estimating the composition of the grazed herbage is not fully explained, but the analyses differed from those of the cut forage, the grazing bullocks selecting the more leafy parts of the plant.

Estimation of cellulose, hemicelluloses, starch, sugars, pectins and lignin in addition to normal proximate constituents reduced the undetermined fraction of the dry matter to only a few per cent.

High negative correlations were obtained between the digestible dry matter content of the herbage and the content of lignin, crude fibre and N-free extractives in the grass, also between the contents of crude fibre, N-free extractives, cellulose and hemicelluloses in the faeces and the digestible dry matter content of the herbage. A high positive correlation was found between the crude protein content of the faeces and the digestible dry matter content of the herbage.

A modification of the normal system of analysis for proximate nutrients is suggested, which eliminates the estimation of crude fibre, but includes that of lignin. The application of this modified analysis to the measurement of total digestible nutrients is explained.—D. M. Walker.

2454

DIJKSTRA, N. D. **De verteerbaarheid en voederwaarde van johannesbroodpittenkiemmeel. [The digestibility and feeding value of the ground germs of carob beans.]** *Landbouwk. Tijdschr.*, 1953, **65**, 191-194. [Rijkslandbouw-proefstat., Hoorn.]

Carob germ meal is a by-product of the preparation of mannogalactan for use in industry. The sample used had the following approximate percentage composition: dry matter 89.4, crude protein 45.1, true protein 42.6, crude fat 5.2, crude fibre 3.6, N-free extract 40.2, and ash 5.9. Digestibility was estimated in a test in which 500 g. carob germ meal was given with 600 g. hay to 3 wethers. The average coefficients were, in the above order: 86.4, 90.3, 91.2, 82.9, 85.2 and 91.1. Starch equivalent is computed with Kellner's V for soya bean meal, 96, to be 74.3. The meal is therefore a valuable feedingstuff.—I. Leitch.

2455

DRZAS, E. and SKULMOWSKI, J. **Oznaczanie współczynników strawności niektórych pasz, używanych do żywienia trzody chlewnej. [On the digestibility coefficients of some feeds used**

in feeding pigs.] *Rocz. Nauk rol.* [B], 1953, 66, No. 2, 83-104. [Inst. Zootech., Dział Żywienia Zwierząt.] Russian and English summaries.

Notwithstanding the great changes, due to selection and management, of the condition of livestock, old coefficients of digestibility are still used. They differ considerably from those found by the authors. They are no longer applicable, and should be revised. Some new figures for pigs are given, for use as a temporary measure until new tables are established. (From summary.)—T. D. Bell.

2456

SKULMOWSKI, J. and TYTRO, W. Współczynniki strawności niektórych pasz, używanych do żywienia drobiu. [Digestibility coefficients of certain poultry feeds.] *Rocz. Nauk rol.* [B], 1953, 66, No. 3, 21-42. [Inst. Zootech., Oddział Paszoznawstwa, Dział Żywienia Zwierząt.] Russian and English summaries.

Many of the digestibility coefficients at present in use are obsolete. Coefficients were estimated for wheat, barley, maize, oats, rye, soya bean, meat-and-bone meal, bloodmeal and a mash of crushed oats, wheat and maize, barley bran and meat-and-bone meal. The results are presented in a table with the figures given by other workers. (From summary.)—T. D. Bell.

2457

BIELIŃSKI, K., SZYFTER-ZIOŁECKA, A., BIELIŃSKA, K. and FILUS, J. Strawność siana z lucerny sprzątanej w różnych okresach rozwoju wegetacyjnego. [Digestibility of alfalfa straw harvested at different stages of growth.] *Rocz. Nauk rol.* [B], 1953, 66, No. 2, 69-82. [Inst. Zootech., Zakł. Doświadczalny, Kołuda Wielka.] Russian and English summaries.

Alfalfa was cut at the following stages of growth: pre-bud, early bud, bud, early flower, flowering and end of flowering. It was given, in the form of chaff, to wethers and digestibility coefficients were estimated by the "silicium" [silica?] method.

The digestibility coefficients of organic substances were inversely related to the fibre content and were affected also by differences in the experimental animals and by differences in the chemical composition of the straw. (From summary.)

P. C. Jowsey.

2458

BIELIŃSKI, K., BIELIŃSKA, K. and GWIZDAŁA, A. Zmiany wartości pokarmowej porostu koni-czynny czerwonej w zależności od momentu jej sprzętu. [Changes of feeding value of red clover as affected by the time of harvesting.] *Rocz. Nauk rol.* [B], 1953, 66, No. 2, 49-67. [Inst. Zootech., Zakł. Doświadczalny, Kołuda Wielka.] Russian and English summaries.

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Analyses of samples of red clover were made every 3 days for 42 days. Kellner's digestibility coefficient was used to calculate the feeding value. There was an inverse relation between crude fibre and digestibilities. The highest yields of digestible protein and feeding value were obtained from 14 to 7 days before flowering. A table indicates the best time for cutting red clover for different classes of stock, and gives the yield per hectare of dry matter, digestible protein and feed units. (From summary.)—T. D. Bell.

2459

GREENWOOD, D. A., WILCOX, E. B., STEFFEN, H., HARRIS, L. E. and SHUP, L. Feed supplements—sugar. Influence on animal carcass of feeding sucrose. *J. Agric. Food Chem.*, 1953, 1, 1112-1115. [Utah Agric. Exp. Stat., Logan.]

Sucrose, from 1 to 3 lb. per head daily, was given to 100 Hereford steers, 2 to 3 years old, for 3 or 6 days, and to 97 heifers for 3 or 5 days, before slaughter. All received the same basal ration. During treatment daily gain in liveweight was increased in all groups compared with controls, and liver weights were also greater. Dressing percentage was increased in the steers treated for 3 days.

With pigs 64 were given 0, 1, 2 or 3 lb. sucrose in addition to the basal ration for 3 or 12 days before slaughter, and 40 the same for 5 or 6 days. As with cattle, sucrose feeding increased the rate of daily gain and weight of liver.

There was no difference between groups of cattle or of pigs in cooking quality of flesh or liver, as judged by organoleptic and shear tests, and sucrose had no effect on the carbohydrate content of liver or muscle.—T. D. Bell.

2460

DAMMERS, J. and DIJKSTRA, N. D. Voederproeven met gedroogde melasse. [Feeding trials with dried molasses.] *Landbouwk. Tijdschr.*, 1953, 65, 476-481. [Rijkslandbouwproefstat. Hoorn.] English summary.

The percentage composition of the dry molasses was: dry matter 99.78, crude protein 12.72, true protein 0.78, carbohydrate 74.91 and ash 12.37.

Tests with 3 wethers in which 600 g. dry molasses was given daily with 600 g. hay gave digestibility coefficients, in the above order, of 88.7, 65.3, negative, 95.0 and 94.0. The digestibility of the crude fibre of the hay was reduced. The starch equivalent is computed to be 58.7 for ruminants and 58.2 for pigs.

Three groups each of 12 pigs weighing about 30 kg. each were uniformly fed for 7 days. Then one group continued on a normal ration and two got 6 per cent. of dry molasses to 60 kg. weight, and

thereafter one group had 12 and the other continued at 6 per cent., the molasses replacing part of the cereals. Daily weight gains were 642, 621 and 615 g. during the first stage and 729, 705 and 676 g. during the second. The difference is not big enough to suggest that molasses depressed growth rate.—I. Leitch.

2461

STEPHEN, J. **The salvage and utilization of food waste for animal feeding. (a) Collection and processing.**

LIVINGSTONE, A. M. **(b) Distribution and utilization.** *J. Roy. Sanit. Inst.*, 1953, **73**, 675-681; 681-687 (with discussion 687-692). [Luton.]

1. Methods of collection, boiling, concentration and fortification with protein-rich wastes, and the future prospects for food waste in view of the decontrol of feedingstuffs and possible cessation of compulsory collection are discussed. The estimated amount of food waste in house refuse in England and Wales is 1,200,000 tons per annum, but it is doubtful whether more than a third of this is utilised for animal feeding at present.

2. The yearly output of waste food concentrate (33 per cent. dry matter, 5 per cent. protein) is about a quarter million tons, equivalent to about 8 per cent. of the rationed feedingstuffs for pigs and poultry in 1951-1952. For pigs 1 ton has a feeding value of about 1/3 ton of good pig food containing 60 per cent. barley meal. On this basis the price of food waste concentrate has roughly kept step with that of cereal feeds but at present is slightly less. Reference is made to a Ministry of Agriculture investigation in which good results were claimed for the use of from 2 to 10 lb., average about 7½ lb. daily, for pigs from 8 or 9 weeks to 26 weeks, with about 3½ lb. meal daily. The waste food concentrate was also good for winter egg production and the rearing and fattening of chickens. All stock were remarkably healthy; this is ascribed to the mineral and vitamin content.

Modification of local council procedure, better publicity and the setting up of a national association of waste processing authorities are suggested to meet the situation arising from decontrol of feedingstuffs. "Waste food concentrate is an excellent stock feed which, on its merits, should be able to compete on a price basis with any other pig or poultry feed on the market."—W. M. Deans.

2462

ROGERS, C. F. and BELL, D. S. **Acceptability of high-drymatter silages.** *Ohio Agric. Exp. Stat. Res. Circular* No. 20, June 1953, pp. 22. [Wooster, Ohio.]

For 4 years silage was made from much-wilted meadow crops. The silages had over 40, usually about 65 per cent., dry matter, and were satis-

factory in taste and smell. They were given to sheep to replace half the ration of standard silage normally given, and though the animals ate the standard silage, to which they were accustomed, first, they readily cleaned up the experimental silages. The dry matter intake was greatly increased, but this did not affect the consumption of hay. In comparison with standard high-legume silage the intake of carotenoids was unexpectedly high. The tests were of short duration and only the acceptability of the silages can be assessed from the results reported. Further investigation into their value for long-term feeding is necessary.—T. D. Bell.

2463

DIJKSTRA, N. D. Proefnemingen over het ensilieren van gras met aardappelvezels en gestoomde aardappelen. [**Experiments in ensiling grass with potato pulp and steamed potatoes.**] *Versl. Landbouwk. Onderzoek.*, 1952, No. 58-10, pp. 20. English summary.

Silage was made in three different ways. First alternate layers of grass, 22 per cent. dry matter (DM), and potato pulp, 18 per cent. DM, were laid down. The quality was poor, pH 4.76, with considerable amounts of acetic and butyric acids and ammonia N equivalent to 20 per cent. of total N. Loss of DM was small, 6 per cent., but of protein high, equivalent to 20 per cent. of total N and 37 per cent. of true protein.

In the second test the grass and potato pulp were mixed by machine: DM 17.1 and 16.8 per cent. The silage contained more acetic but less butyric acid and less ammonia than the first lot. Loss of carbohydrate was greater but of protein less. Digestibility of the grass used, by wethers, was high; that of the protein of the silage much less.

In the third trial the potatoes were steamed and mixed with the grass by machine: DM 13.5 and 21.7. The silage was excellent, pH 3.79, little acetic and no butyric acid; little ammonia and the digestibility of the protein much better. Losses of carbohydrate and protein were still high and that is attributed to the low DM content of the grass.—I. Leitch.

2464

DUBISKI, J., PRZECZEK, T. and SIUDAK, F. Trzcina jeziorna i turzyca jako surowiec kiszonkowy. [**Common reed and reed grasses as silage plants.**] *Rocz. Nauk. rol. [B]*, 1953, **66**, No. 1, 97-107. [Kat. Żywienia Zwierząt Wyższej Szkol. Rol., Olsztyn.] Russian and English summaries.

Silage made in the laboratory from the common reed (*Pharmites communis*) and reed grasses (*Carex*

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spp.) was satisfactory in all respects and was readily consumed by cattle, horses and pigs. (From summary.)—P. C. Jowsey.

2465

REID, J. T. Urea as a protein replacement for ruminants: a review. *J. Dairy Sci.*, 1953, **36**, 955-996. [Dept. Animal Husb., Cornell Univ., Ithaca, N.Y.]

2466

SCHRENK, W. G., MITCHELL, H. L., SILKER, R. E., GRANDFIELD, C. O., HONSTEAD, W. H. and TAECKER, R. G. Dehydrated alfalfa. *Kansas Agric. Exp. Stat. Bull.* No. 356, February 1953, pp. 64. [Manhattan, Kans.]

2467

GORDON, W. S. and TAYLOR, J. H. Antibiotics as supplements to the ration of farm livestock. *Vet. Rec.*, 1953, **65**, 838-844 (with discussion 845-846). [Agric. Res. Coun., Field Stat., Compton, Berks.]

2468

JACQUOT, R. (with MERAT, P.) Les tourteaux alimentaires. [Oilcakes as feed.] *Monogr. de*

L'Institut Technique d'Études Recherches des Corps Gras, 1949, pp. 63.

2469

CASTLE, M. E. and HALLEY, R. J. The grazing behaviour of dairy cattle at the National Institute for Research in Dairying. *Brit. J. Animal Behaviour*, 1953, **1**, 139-143. [Nat. Inst. Res. Dairying, Univ. Reading.]

2470

MELVILLE, J. Pasture quality and animal production. *Proc. N.Z. Soc. Animal Prod.*, 1953, **13**, 65-73. [Grasslands Div., Palmerston North.]

2471

SHARABRIN, I. G. [Mineral nutrition of farm animals.] *Sovet. Zootekh.*, 1953, **8**, No. 2, 79.

2472

FOLLEY, S. J. The use of hormones in nutrition: some practical possibilities. *Gegenwartigprobleme der Ernährungsforschung, Symposium, Basle*, October 1952, 214-227 (with discussion 228-229). Verlag Birkhäuser, Basle, 1953. Price S. fr. 32. [Nat. Inst. Res. Dairying, Univ. Reading.]

See also Abst. 1676.

HORSES

2473

SOKOLOV, A. V., KOSTIN, A. A. and GOLOBOV, A. G. Skarmlivanie lozhadyam belkovykh gidroliznykh drozhzhei v kombikorme i ikh vliyanie na perevarimost', azotisty i mineral'ny obmen. [Feeding protein hydrolysed yeast in the ration to horses and its effect on digestion and nitrogen and mineral metabolism.] *Konevodstvo*, 1953, No. 6, 20-25.

Horses were given the following ration: hay 40, oats 35, wheat bran 15, hydrolysed yeast 3, molasses 6.5, chalk 0.25, salt 0.25 per cent.; the yeast was excluded from the ration of a control group. In 6 months the average weight of animals in the test group increased by 19.9 kg., in the control group by 17.7 kg. There was no ill effect on health. The average daily balance of N and minerals was positive at the start of the test and after 4 months. The nutritive value of 100 kg. of the ration with yeast represents 72.98 kg. feed units, without yeast 71.51 kg. Six months' storage had no ill effect on the test ration.—E. W. Birse.

2474

PACHECO JORDAO, L., XAVIER DE CAMARGO, M. and FURTADO GOUVEIA, P. Eficiência, na reprodução, do plantel Anglo-Árabe da Coude-laria Paulista. [Breeding efficiency of the

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Anglo-Arab stud of the Coudelaria Paulista.] *Bol. Indust. animal, São Paulo*, 1952, **13**, 63-77. [Div. Zootec. Nutrição Animal.] English summary.

The number of mares on any one ranch varied from 17 to 39. There were recorded in all 381 mare-years with a mean fertility of 60.6 per cent. In percentages, abortions were 6 and stillbirths 1.8, deaths before weaning 7.9 and foals weaned 44.9. Services per gestation of fertile mares averaged 6.41. Old mares, 15 years and over, had more abortions and more deaths before weaning. Average age at first delivery was 4.93 years.

I. Leitch.

2475

PACHECO JORDAO, L., XAVIER DE CAMARGO, M. and FURTADO GOUVEIA, P. Eficiência, na reprodução, do plantel P. S. Ingles da Coude-laria Paulista. [Breeding efficiency of the stud of purebred English horses of the Coudelaria Paulista.] *Bol. Indust. animal, São Paulo*, 1952, **13**, 47-62. [Div. Zootec. Nutrição Animal.] English summary.

The data cover 258 mare-years, 11 thoroughbred mares, 1 Arab, 1 Anglo-Arab, 2 Trakehnen and 1 Hackney. In percentages, abortions were 7.4 and stillbirths 5, deaths before weaning 21, and survivals to weaning, in terms of mares served, only

29-1. Fertility averaged 49.2 and varied from 30 to 76.2 per cent. in different years. Mares that became pregnant required on the average 4.7 services. Average age at first delivery was 4.71 years and some, the older, mares, 15 to 21 years, were responsible for most of the early deaths. The stallions were of low fertility also.

The pasture grazed was of *Chloris gayana*, *Penisetum clandestinum*, *Melinis minutiflora* and *Hyparrhenia rufa*. A concentrate ration of maize, oats and wheat was used with legume hay and a salt mixture of NaCl, Co, CuSO₄, Mg and I.

I. Leitch.

2476

PRAWOCHEŃSKI, R. and PIOTRASZEWSKI, W. Wyniki prób dzielności koni z 1951 roku z zastosowaniem siłomierza. [Results of efficiency tests with horses made in 1951 with the use of a dynamometer.] *Rocz. Nauk rol.* [B], 1953, 66, No. 1, 121-126.

2477

SIGRIST, A. V. Po voprosu o molochnom konevodstve. [The problem of breeding horses for milk.] *Konevodstvo*, 1953, No. 7, 35-36.

See also Abst. 1997.

CATTLE

GROWTH AND FATTENING

2478

LEROY, A. M., HEIM DE BALSAC, H., DELAGE, J. and POLY, J. Les courbes de lactation: leur intérêt en élevage. [Lactation curves: their importance in rearing.] *Lait*, 1953, 33, 394-400. [Lab. Zootech., Inst. Nat. Agronom., Paris.]

A general discussion.

2479

JACQUOT, R. and ROUX, P. Le sevrage précoce du veau et les aliments économiseurs de lait. [Early weaning of calves and milk substitutes.] *Production du Lait*, 1951, 187-223 (with discussion 224-228). [Labs. Biochem. Nutrit., C.N.R.S., Bellevue, Paris.]

2480

MAGRUDER, N. D., KNOTT, C. B. and WILLIAMS, P. S. Ammoniated feed. Ammoniated industrial by-products in dairy heifer rations. *J. Agric. Food Chem.*, 1953, 1, 944-946. [Pennsylvania Agric. Exp. Stat., State College.]

An ammoniated hemicellulose extract (wood sugar derivative) was given at a 10 per cent. level in a grain ration to a group of 4 non-pregnant Holstein heifers during a 90-day trial. The extract supplied about 20 per cent. of the daily N requirement. A similar grain ration supplemented with soya bean oil meal was given to a comparable group of heifers. The rations of both groups were adjusted to comply with Morrison's recommended feeding standards for growing dairy cattle. Body-weight gains and feed conversion efficiencies were similar in both groups.—J. N. Aitken.

2481

KNOTT, C. B., ROSS, E. B. and STEIN, J. F. Further studies of aureomycin in feed for-

mulas for dairy calves. *J. Dairy Sci.*, 1953, 36, 1201-1204. [Dept. Dairy Husb., Pennsylvania Agric. Exp. Stat., State College.]

Three groups of 12 Holstein bull calves were given 2, 6 and 10 g. aureomycin per 100 lb. of milk replacement, which consisted of non-fat milk solids 50, dried whey 10, distiller's dried maize solubles 15, soluble blood flour 10, dextrose 7 and oat flour 5 lb. with vitamins A and D, and a control group had no aureomycin. Alfalfa hay and a calf starter were also given to all calves to appetite. The calves given aureomycin gained in weight and in height at withers more rapidly than those without aureomycin. There was no significant difference between the groups in feed utilisation. The incidence of scours was low in all groups. Aureomycin did not influence the condition of the faeces.—J. N. Aitken.

2482

ELLSWORTH, S. A., HUFFMAN, C. F., SMITH, C. K. and RALSTON, N. P. Effect of feeding antibiotics to dairy calves: 1. Aureomycin and bacitracin feed supplements. *Quart. Bull. Michigan Agric. Exp. Stat.*, 1953, 36, 60-66. [Dept. Dairy.]

Newborn Holstein, Brown Swiss, Guernsey and Jersey heifer calves were used. Aureomycin was given in milk at a level of 1 mg. per lb. bodyweight to a group of 8 calves, and a group of 4 calves received bacitracin at the same rate. A group of 9 calves was used as control. All calves received whole milk for about 2 months and reconstituted skimmed milk for an additional 2 to 3 months. Alfalfa hay and a grain mixture were also given. Antibiotic feeding was discontinued at 100 days of age.

During the experimental period the supplemented calves made higher bodyweight gains and utilised their feed more efficiently than the controls. The growth rates of control and treated groups were similar after the withdrawal of antibiotics.

N.A. and R., April 1954

Bacteriological studies of faeces showed no difference between control and treated groups.

J. N. Aitken.

2483

GREEN, W. W. and BURIC, J. **Comparative performance of beef calves weaned at 90 and 180 days of age.** *J. Animal Sci.*, 1953, **12**, 561-572. [Dept. Animal Husb., Univ. Maryland.]

From 1949 to 1951, 62 purebred Aberdeen-Angus and Hereford calves of both sexes were weaned either at 90 or 180 days and were then fed individually until 370 days of age. All calves were weighed at birth, 90, and 180 days, and also at the end of each week for 4 weeks after weaning, and at the end of each 28-day feeding period until 370 days old. Heifers weaned at 90 days were lighter in weight on reaching 180 days than those weaned at the later date, but at one year of age they had made up the difference. The average rate of gain per 28-day feeding period was more uniform for the 90-day than for the 180-day weaned calves.—E. L. B. Haskew.

2484

GIULIANI, R. Le esigenze nutritive dei bovini da carne secondo le attuali conoscenze nel campo della nutrizione animale. 2. [Nutritive requirements of beef cattle according to present knowledge in the field of animal nutrition. 2.] *Riv. Zootec.*, 1953, **26**, 309-312.

A discussion based on the allowances of the U.S. National Research Council, Committee on Animal Nutrition.

2485

ESKEDAL, H. W. and NIELSEN, J. Forsøg med fedning af slagtekvæg. [Experiment on the fattening of cattle for the butcher.] *Forsøgs-lab. København Beretn.*, 1953, No. 269, pp. 80. English and German summaries.

Experiments are described on the fattening of cattle for the butcher, with a total of 102 cows, 33 bullocks and a few calves. In each experiment there were equal numbers of controls and experimental animals, of which 34 cows were given 100 g. and 17 were given 50 g. methyl thiouracil preparation for 32 to 35 days. Data are given for the rations used, for initial and final liveweights, weight at slaughter, cold carcass weight, weight of liver and all offal. In 7 of the 9 tests with cows, the fat and dry matter contents of back muscles, as samples of the carcass, were estimated and, in one test, the weight of bone in 2 carcasses was ascertained.

Of the excess of liveweight at slaughter, about 47 kg. in cows given 100 g. of the drug, roughly 35 per cent. (16 kg.) was due to excess weight of stomachs and their contents. The treated animals looked fatter and the bullocks fetched a higher

price per kg. The analyses showed that the fat of meat was reduced by 100 g. of the drug daily, but not by 50 g. In all except 1 of these tests in which analyses were made, fat-free dry matter was also less in the treated animals; it was less in treated calves, but fat was higher.

[From these analytical data it has been computed that the mean difference in weight of carcass meat between 30 untreated and 30 comparable cows given 100 g. methyl thiouracil daily can be attributed to water and of the mean difference between 17 controls and 17 given 50 g. of the drug three-quarters was water.]-I. Leitch.

2486

KLOSTERMAN, E. W., KUNKLE, L. E., BENTLEY, O. G. and BURROUGHS, W. **Supplements to poor quality hay for fattening cattle.** *Ohio Agric. Exp. Stat. Res. Bull.* No. 732, May 1953, pp. 20. [Wooster, Ohio.]

Between 1948 and 1952 trials were made in fattening Hereford steers on poor quality hay with different protein supplements. Full details of the treatments and performances of the groups of about 10 steers each are given in tables.

All animals received hay, corn-and-cob meal and minerals, and a supplement. This was usually soya bean meal with either partial or complete replacement by meat scraps, alfalfa meal, urea, dried distiller's solubles, molasses or maize silage.

A mixture of meat scraps and soya bean meal was no better than soya bean meal alone, nor were mixtures of soya bean meal with urea, meat scraps and distiller's dried solubles in different proportions. Alfalfa meal was better than soya bean meal when completely replacing it, but cost slightly more. Urea was satisfactory as a source of N when given as 50 per cent. of the protein supplement. The addition of molasses, or the ash of alfalfa or molasses fermentation solubles, or a complex trace mineral mixture, improved the poor quality hay ration, which suggested a deficiency of trace elements in hay. Molasses also improved performance on good quality hay rations, in that 0.75 lb. soya bean meal was as good as 1.5 lb. when molasses was given. Maize silage improved rates of gain on poor quality hay but not on good quality hay. The difference between good and poor quality hay was highly significant, and indicated the importance of producing the former for economical fattening.

T. D. Bell.

2487

MILLER, J. I. and MORRISON, F. B. **Use of pasture for fattening steers.** *Cornell Univ. Agric. Exp. Stat. Bull.* No. 890, March 1953, pp. 35.

A series of 9 trials was made between 1943 and 1949 comparing different methods of feeding steer calves and yearlings on pasture with or without

supplements. Full experimental results are presented in detail.

Calves purchased in autumn, wintered on a growing ration, put to pasture till August and full-fed in dry lot before slaughter as yearlings ate less maize but more hay and silage and were more profitable than similar calves raised in dry lot throughout. Heavy calves receiving a wintering ration plus 2 lb. maize gained faster than those not receiving the maize, but when they were turned out to pasture the latter gained more quickly. Over the whole period, which included finishing in dry lot, those receiving maize in the first period had a greater rate of liveweight increase.

Yearling steers purchased in spring and fattened off grass gave the poorest return of the feeding methods studied. Full feeding with ground maize on pasture increased rate of gain and profit. Steers fed in this way were also slightly more profitable than similar beasts that grazed till August and were finished by full feeding in dry lot. When the period of grazing was extended the financial returns were slightly better.

On the whole it was more profitable to purchase calves in the autumn, feed through the winter, and fatten on pasture with a supplement than to purchase in the spring for fattening. The winter feeding should be mainly of good roughages.

T. D. Bell.

2488

HOLMES, W. **Feeding grass. The use of grazing silage, hay and dried grass in feeding dairy and beef cattle.** Dept. Agric. Scotland Advisory Leaflet No. 25 (New Ser.), H.M.S.O., Edinburgh, 1953, pp. 20. Price 1s. net.

General principles are outlined for the most effective and economical use of grassland by cattle. Rations using silage, hay and dried grass are suggested for different classes of stock. The compositions of the different grades of preserved grass are given, with advice on how to classify them in practice. The changes in the value of grass with stage of development, soil fertility, rate of growth and pasture management are discussed.—T. D. Bell.

2489

DODSWORTH, T. L. **Grass silage for beef.** *Scot. Agric.*, 1953, **33**, 88–91. [N. Scotland Coll. Agric.]

Cross Shorthorn and cross Aberdeen-Angus steers were divided into 4 comparable groups of 6 animals each. The following rations were given: swedes, oat straw, hay and crushed oats; swedes and oat straw in the morning and silage in the evening; silage in the morning and swedes and oat straw in the evening; silage only. All animals were slaughtered and graded at the end of the trial. The group fed on silage alone graded better than the other groups, and the group fed

on silage in the morning and swedes and oat straw in the evening made smaller daily gains and showed the poorest degree of finish. There was little difference between the other two.—J. N. Aitken.

2490

VAN ARSDALL, W. J., HOEFER, J. A., BRANAMAN, G. A. and LUECKE, R. W. **Supplementing corn silage for fattening steers.** *Quart. Bull. Michigan Agric. Exp. Stat.*, 1953, **36**, 46–49. [Dept. Animal Husb.]

Steers of initial liveweight about 760 lb. were given maize silage to appetite and supplements of soya bean meal and molasses feed, soya bean meal, ground maize and soya bean meal, or ground maize and urea. They received 3.5 lb. of the supplement daily (3.82 of the maize and urea). They were fattened for 146 days to a liveweight of about 1100 lb. Daily liveweight increases were 2.33, 2.18, 2.07 and 2.37 lb. for the 4 groups, respectively. The grading at slaughter was nearly the same for all groups. The maize-urea group required least silage, and the soya-molasses group least supplement, per unit of liveweight gain.

T. D. Bell.

2491

JOHNSON, L. E., MOXON, A. L. and SMITH, R. L. **Wintering beef cows on South Dakota ranges.** *S. Dakota Agric. Exp. Stat. Bull.* No. 419, May 1952, pp. 26.

The results of 4 wintering trials made between 1942 and 1950 at 2 centres in South Dakota showed that supplementary feeding was necessary for breeding cows maintained on the range. Stacked or windrowed hay, sorghum fodder or protein concentrate was used as a supplement, and a mineral mixture was given at all times. Ten lb. of good quality roughage was better than 1 lb. of 40 per cent. protein concentrate, but poor quality roughage was inferior. Twice or three times as much windrowed hay was needed as stacked hay. Over a period of years, the effect of inadequate rations on bodyweight of the cows was cumulative, and this was reflected in the calf crop and weight at weaning, but after one year only on the inadequate ration there was rapid recovery, and performance was not much below that of supplemented animals. The cows in these experiments were served between July and September and the calves were weaned in early November.

T. D. Bell.

2492

BOTHA, J. P. **Further results of a spring resting period on the sour veld.** *Farming in S. Africa*, 1953, **28**, 335–339. [Agric. Res. Inst., Pretoria.]

Better liveweight increases were made by bullocks on sour veld burned in August (early spring) and grazed as soon as there was sufficient

growth than by those on paddocks rested on the average for 19 days after burning. The observations were made on 2 paddocks for 13 years. Over this period the rested paddocks maintained their productivity, but the unrested declined. It is suggested that a year without grazing every fifth year would maintain the unrested paddocks at a suitable level.—T. D. Bell.

2493

BARNARD, W. G. **The cattle of the Swazi.** Vet. Dept., Swaziland, Mpisi Series No. 4, May 1953, pp. 17.

This is a progress report of the work of the Mpisi Cattle Breeding Experimental Station. Purebred Afrikaner and Nguni herds and crosses between these breeds are maintained. Improvement of the Nguni is aimed at and selected bulls are reared for acquisition by the native farmers, but so far the response has been disappointing. Some experimental work on veld improvement is also in hand.—T. D. Bell.

2494

BONSMAN, J. C., VAN MARLE, J. and HOFMEYER, J. H. **Climatological research on animal husbandry and its significance in the development of beef-cattle production in Colonial territories.** *Empire J. Exp. Agric.*, 1953, **21**, 154-175. [Dept. Animal Husb. Res., Mara Res. Stat., South Africa.]

From work done at the Mara and Messina Research Stations, and from observations made in the different climatic regions, the records of different types of cattle of exotic and indigenous breeds and their crosses were studied under semi-arid and sub-tropical environments in relation to heat tolerance, growth rate, fertility, resistance to disease and mortality rate. Lack of adaptability of a breed or strain to a particular environment results in slow growth, low fertility and high mortality. Although the mortality rate of crossbred and Hereford cattle has been reduced by selective breeding for increased adaptability, these cattle are still not so robust and resistant as indigenous stock. Six fundamental rules are recommended for the selection of cattle for these semi-arid and sub-tropical regions, and a variety of suitable breeds and types are suggested for 5 types of environment.—E. L. B. Haskew.

See also Absts. 1745, 1845, 1980, 2234, 2689.

MILK PRODUCTION

2495

GIULIANI, R. **Le esigenze nutritive dei bovini da latte secondo le attuali conoscenze nel campo della nutrizione animale.** [Nutritive require-

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ments of milk cows according to present knowledge in the field of animal nutrition.] *Riv. Zootec.*, 1953, **26**, 277-281.

A review based on the U.S. National Research Council's recommendations.

2496

HANCOCK, J. **Studies in monozygotic cattle twins.**

7. The relative importance of inheritance and environment in the production of dairy cattle.
8. Performance of identical twins when uniformly treated after having been subjected to different treatments in the previous lactation.
9. The value of identical twins in short-term trials. *N.Z. J. Sci. Technol.* [4], 1953, **35**, 67-92; 93-96; 97-116. [Ruakura Animal Res. Stat., N.Z. Dept. Agric., Hamilton.]

7. The effects of 3 widely different levels of nutrition on milk, butterfat and casein production were estimated with 15 sets of monozygotic twins. The twins were divided into 3 groups of 10 animals each and were assigned to the treatments A, B and C so that 5 sets were split between treatments A and B, 5 between B and C and 5 between A and C.

Cows on the A treatment rotationally grazed a 10-acre pasture. Silage or hay was given whenever the grass was thought to be insufficient for their needs. All cows in this group received 1 lb. of a concentrate mixture for each 5 lb. of milk produced, irrespective of stage of lactation or level of production. Cows on the B treatment were allowed to graze a similar area of 10 acres and were treated in the same way except that concentrates were not given. Cows on the C treatment rotationally grazed an area of only 6 acres and received only 60 per cent. of the amount of silage and hay consumed by cows on the B treatment. Concentrates were not given. Milk weights were recorded daily and representative samples were analysed for butterfat and casein. Crude production figures were converted to a maturity equivalent basis by the addition of 70 and 35 lb. butterfat to the yields of 2- and 3-year-old heifers, respectively.

The experiment was continued over 3 consecutive milking seasons. Milk, butterfat and casein production of the animals on treatment C were reduced by about 30 per cent. below that on treatment A and by 10 per cent. below that on treatment B. Milk composition was only slightly affected by treatment.

Coefficients of heritability, defined as the proportion of the total variance directly due to genetic differences between individuals in a specified population, were determined for the characteristics studied, with the following results: milk yield 0.90, butterfat yield 0.86, casein yield 0.88, butterfat percentage 0.95 and casein percentage 0.94. Genetic correlations between the characteristics were also determined. The results are discussed in detail

and their importance in any programme of breeding and selection is emphasised.

8. The post-treatment performance of 10 of the original 15 sets of twins is reported. All animals were treated uniformly during the dry period following the termination of the above experiment.

Differences in bodyweight between poorly fed and well fed twins tended to disappear during the dry period when all sets were fed in the same way. Previous treatment had little effect on yield of milk, butterfat or butterfat percentage over a 200-day lactation.

It is concluded that, since the after-effects of previous treatments were negligible, identical twins can still be used for further trials involving milk and butterfat production provided the poorly fed members of the twin sets are given a chance to recover during the dry period preceding the new trial.

9. Two trials are described. In the first the effect of "steaming up" for 1 month before calving was estimated on 8 sets of twins. One member of each twin set received a concentrate mixture of crushed barley and linseed cake in the proportion of 4 to 1 at the rate of 1 per cent. of bodyweight daily. The remaining member of each set received no concentrate. After calving both groups were given concentrates at the rate of 1 lb. per 5 lb. milk produced for the first month and half this amount for the second. All animals had access to an autumn-saved pasture and received silage to appetite.

The meal-fed cows made greater weight gains and their calves were in general heavier than those of the controls. Treatment had no effect on bodyweights during the first 3 months after calving. During the same period milk and butterfat production increased by 10 and 11 per cent., respectively. Since bodyweight after calving was unaffected by treatment it was concluded that the higher production was not due to reserves on which the meal-fed animals could draw.

In the second trial turnips were compared with grass silage as a pasture supplement for milking cows. Nine sets of twins were split between the 2 treatments. A 17-acre pasture area was divided into 2 equal parts and one half was allotted to the silage group and the other to the turnip group. Both silage and turnips were given so as to supply about half the normal dry matter intake. This was done by giving the silage group 550 to 600 lb. and the turnip group 1000 lb. daily. The experiment was made over a period of 8 weeks, during the declining phase of lactation in midsummer when grass was scarce owing to drought. The turnip group lost weight rapidly during the first 4 weeks of treatment, but weight was rapidly regained on conclusion of the experiment.

The turnip-fed cows produced about 9 per cent.

more milk and butterfat than their pair mates on silage.

The value of identical twins in this type of short-term experiment is discussed briefly.—J. N. Aitken.

2497

DONALD, H. P. **A study of variation in twin cattle. 1. General description.**

DONALD, H. P. and ANDERSON, D. **2. Fertility.** *J. Dairy Res.*, 1953, **20**, 355-360; 361-369. [Agric. Res. Council, Animal Breeding Res. Organiz., Edinburgh.]

2498

RAGSDALE, A. C., THOMPSON, H. J., WORSTELL, D. M. and BRODY, S. **Environmental physiology and shelter engineering with special reference to domestic animals. 21. The effect of humidity on milk production and composition, feed and water consumption, and body weight in cattle.** *Missouri Agric. Exp. Stat. Res. Bull.* No. 521, April 1953, pp. 23.

For details of management and housing see Absts. 4175, Vol. 19; 4420, Vol. 20; 2832 and 5049, Vol. 21.

Lactating Holstein, Jersey and Brown Swiss cows as well as 2 dry Jersey and 2 dry Brahman cows were used. During the winter of 1950 the studies were concerned with the effect of humidity at 12° and 40° F. and in the summer of 1951 at 75°, 85°, 95° and 100° F. Changing humidity did not affect the physiological reaction at low temperatures but above about 75° F. increasing humidity depressed the milk production and feed consumption of all animals. Feed consumption rapidly returned to normal during control periods at 65° F., and milk production returned to near its original level. The shape of the feed consumption curves with increasing temperature of the non-lactating Jersey and Brahman cows was similar to that for the lactating cows. The percentage of butterfat tended to increase with decreasing milk production but the percentage of solids-not-fat showed little, if any, change.

W. Godden.

2499

AITKEN, J. N., BOYNE, A. W. and CRICHTON, J. A. **The effect of feeding iodinated casein and L-thyroxine upon the health, reproduction and yield of a dual-purpose breed of cattle and a purely dairy breed.** *J. Dairy Res.*, 1953, **20**, 291-300. [Rowett Res. Inst., Bucksburn, Aberdeenshire.]

Iodinated casein or L-thyroxine of equivalent potency was given to Red Poll (dual purpose) and Ayrshire (dairy) cattle for periods of 15 weeks during 4 lactations. The dose was 20 g. iodinated casein or 8 mg. L-thyroxine daily, reduced to 10 g. and finally 5 g. during the last 3 weeks of treat-

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ment. The effects on general health, reproduction, bodyweight, milk yield and butterfat were recorded.

There was no adverse effect on general health or reproduction, though bodyweight declined temporarily in some of the treated animals; all the control animals gained weight. The long intervals between consecutive treatments allowed complete recovery. In the early stages of treatment there was an increase in daily milk yield, but this did not persist till the end of treatment. Control animals had significantly longer lactations than treated, and total lactation yield was not improved by treatment. There was no change in butterfat percentage.—T. D. Bell.

2500

ESKEDAL, H. W. Fedtfattigt og fedrigere kraftfoder til malkekøer. [**Low-fat and high-fat concentrates for milk cows.**] *Forsøgslab. København Beretn.*, 1953, No. 268, pp. 45. English and German summaries.

There were 4 experiments. In the first, 3 groups of cows were given pressed linseed cake, extracted linseed meal or linseed. Average daily data were: roughage consumed, 7.58; 7.43 and 6.83 feed units, intake of crude digestible fat 229, 112 and 580 g. and yield of fat-corrected milk 15.99, 14.60 and 16.97 kg. In the second experiment there were also 3 groups, with no oil, 117 g. rape oil or 91 g. soya bean oil daily per cow. Corresponding data were roughage 8.21, 8.20 and 8.20 feed units, fat intake 194, 321 and 294 g. and milk yield 13.91, 15.28 and 16.00 kg. There were only 2 groups in the third experiment, one with no oil and the other with an addition of 192 g. crude fat, mostly lard, and the data were: roughage 7.40 and 7.40 feed units, fat intake 100 and 292 g., and milk yield 15.33 and 17.15 kg. In the fourth experiment all 3 groups of cows had the same amounts of roughage, 8.21 feed units, but differences in the composition of the concentrate mixture gave intakes of 192, 254 and 252 g. digestible crude fat. In this case yields were 13.96, 14.41 and 14.48 kg., respectively. In all 4 experiments iodine values of the milk fat were estimated.

The results of all experiments indicated that milk yield was highest in cows getting the extra fat. The effect on the quality of the butterfat was generally to raise its iodine value and to overcome the hardness which is a character common in Danish butter produced during winter months. (From summary.)—D. Harvey.

2501

PRATT, A. D. and MONROE, C. F. **Expeller vs. solvent process linseed oil meal for milking cows.** *Ohio Agric. Exp. Stat. Res. Bull.* No. 731, April 1953, pp. 18. [Wooster, Ohio.]

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Expeller-process and solvent-extracted linseed oil meals were given to 2 groups of 13 milking Holstein cows during a 100-day trial. Both groups received the same basal ration. The expeller-process meal and the solvent-extracted meal contained 4.43 and 1.34 per cent. fat, respectively. In a second similar trial with 2 groups of 25 cows each the solvent-extracted meal used contained only 0.84 per cent. fat. In both trials roughage was given to appetite.

Statistical analysis of the results showed that there was no difference between the groups in the amount of fat-corrected milk produced. All animals gained weight during the trials.

The almost complete removal of the fat did not reduce the conditioning effect for which linseed oil meal is noted.—J. N. Aitken.

2502

LOOSLI, J. K. and WARNER, R. G. **Distillers feeds as protein supplements in concentrate mixtures for milking cows.** *J. Dairy Sci.*, 1953, **36**, 1135–1139. [Dept. Animal Husb., Cornell Univ., Ithaca, N.Y.]

The value for milk production of maize distiller's dried grains with solubles, maize distiller's dried grains and maize distiller's dried solubles was compared in rations in which they supplied the principal protein supplement to oats and barley. The 3 rations were adjusted to contain about 18 per cent. total protein. Holstein cows were used. Maize distiller's dried grains had a slightly higher value for milk production than the other two feeds. The differences were not statistically significant.

J. N. Aitken.

2503

PORTER, G. H., JOHNSON, R. E., EATON, H. D., ELLIOTT, F. I. and MOORE, L. A. **Relative value for milk production of field-cured and field-baled, artificially dried-chopped, artificially dried-ground and artificially dried-pelleted alfalfa when fed as the sole source of roughage to dairy cattle.** *J. Dairy Sci.*, 1953, **36**, 1140–1149. [Dept. Animal Indust., Storrs Agric. Exp. Stat., Univ. Connecticut, Storrs.]

Two experiments are described. In the first, milk production of cows given artificially dried, pelleted alfalfa hay was increased and butterfat decreased when compared with the other hays studied. In the second experiment consumption of hay in the pelleted form was reduced, with a consequent decrease in milk production. This result was attributed to the hardness of the pellets.

J. N. Aitken.

2504

CASTLE, M. E. **Fodder beet for dairy cattle.** *Agriculture, J. Minist. Agric. Engl.*, 1953, **60**, 406–408. [Dept. Animal Husb., Vet. Fac., Univ. Liverpool.]

2505

CASTLE, M. E. **Grassland production and its measurement using the dairy cow.** *J. Brit. Grassland Soc.*, 1953, **8**, 195-211. [Nat. Inst. Res. Dairying, Univ. Reading.]

For 3 years pastures of cocksfoot and white clover and ryegrass and white clover were grazed by groups of 10 cows, adjusted periodically so that the average stage of lactation of the groups was the same at all times. In 1949 the leys were rotationally grazed, and in 1950 and 1951 strip grazing with fore-and-aft electric fencing was practised. Silage was made each year and fed on the pasture during the grazing season, which was continuous from April to November. Total milk yield and quality of milk were recorded. Samples of the swards before entry of the cattle, from cages, and after grazing were analysed.

The ryegrass pasture gave 18.7 per cent. more milk per acre than the cocksfoot, though there was little difference between them in total dry matter per acre. The average dry matter consumption daily, calculated from the liveweight and liveweight changes of animals, was 2.9, 2.9 and 2.5 lb. per cwt. liveweight for 1949, 1950 and 1951, respectively. The average daily milk production for the 3 years was 25.1 lb. Butterfat and solids-not-fat percentages were at all times satisfactory. Estimated from the nutrient requirements of the stock, the total output of the pastures was 25.1 cwt. utilised starch equivalent per acre per year, but calculated from herbage data it was 9 to 23 per cent. more.

The use of the technique and its practical application are discussed.—T. D. Bell.

2506

GRIFFITHS, T. W. and FEATHERSTONE, J. **Making better use of silage.** *Agriculture, J. Minist. Agric. Engl.*, 1953, **60**, 409-411. [Nat. Agric. Advisory Serv., W. Midland Province.]

Well-made silage can be put to good use for fattening cattle or for milk production. The desirability of analysing the silage so that it can be properly rationed is emphasised.

In the feeding trial 4 Dairy Shorthorn steers, from 9 to 11 months old, gained on the average 1.37 lb. daily for 4½ months. The daily ration was 30 lb. silage and 4 lb. concentrate (oats 75, calf nuts 25 per cent.) for the first month; 30 lb. silage and 3 lb. oats (reduced to 1½ lb.) for the second month; and 40 lb. silage thereafter. They had oat straw to appetite all the time. The silage had 24.8 per cent. dry matter with 14.2 per cent. crude protein.

There were 15 Ayrshire cows in the milk production trial. They were given 60 lb. silage, 5 lb. hay and 7 lb. of a mixture of oats 90 and fishmeal 10 per cent. for maintenance and the first 2 gal.;

4 lb. of a mixture of oats 77, fishmeal 10 and groundnut cake 13 per cent. for the third gal.; and 3½ lb. dairy cake for each gal. over 3. The silage had 18.5 per cent. dry matter with 12.8 per cent. crude protein. Milk yield was well maintained, but dropped when the silage was reduced.

T. D. Bell.

2507

TURNER, C. **Self-feeding of silage.** *Agriculture, J. Minist. Agric. Engl.*, 1953, **60**, 358-362. [County Agric. Advisory Office, Buckinghamshire.]

A farm trial is reported in which winter handling of silage was avoided by allowing the dairy herd permanent access to a stack of silage in a concrete yard. The cows ate on the average 86 lb. per head daily, there was no waste and results to date seem encouraging. Further observations will enable improvements to be made in the system.

T. D. Bell.

2508

SINGH, H. and DAVE, C. N. **Investigations into the variations of quantity and quality of milk from different quarters of udder.** *Indian J. Dairy Sci.*, 1953, **6**, 97-103. [Minist. Food and Agric., New Delhi.]

Five Sindhi cows were hand-milked daily at the same hour by the same milker. Separate records were kept for the separate quarters, for the 2 fore and 2 hind quarters, and for the 2 right and 2 left quarters of each udder. The order of milking the quarters or pairs of quarters was varied. The results are presented in detail.

The 2 hind quarters yielded on the average 33 per cent. more milk than the 2 fore quarters, irrespective of the order of milking. The 2 right quarters yielded on the average 12.2 per cent. more milk than the 2 left quarters, irrespective of the order of milking.

It was concluded that the right hind quarter generally gave the highest individual yield.

P. C. Jowsey.

2509

PROCTER, J. and HOOD, A. E. M. **The close-folding of dairy cows.** 2. *J. Brit. Grassland Soc.*, 1953, **8**, 239-244. [Imperial Chemical Industries, Ltd., Jealott's Hill Res. Stat., Bracknell, Berks.]

Close-folding with about 70 cows per acre was compared with rotational grazing with about 10 cows per acre. The trial was made on 6 pairs of 3-acre paddocks, 3 pairs of which were of a second year cocksfoot and clover sward, while the other 3 consisted of first year timothy, meadow fescue, cocksfoot and clover. Pre-grazing and residue samples of grass were taken before and after each grazing.

The milk yields of the cows on the close-folding system were significantly higher than those on the

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rotational system. Close-folding resulted in a 25 per cent. better utilisation of the herbage. These results are substantially in agreement with those already reported in Abst. 6042, Vol. 20.

J. N. Aitken.

2510

OKSANEN, E. H. Havaintoja pihatoista kylmillä seuđuilla. [**Loose housing barns in cold regions.**] *Maataloust. Aikakausk.*, 1953, **25**, 93-98. [Dept. Agric. Econ., Univ. Helsinki.] English summary.

From observations in America it is claimed that loose housing barns for dairy cattle are quite suitable, even in cold climates, if the buildings are properly constructed and operated. The bedding area must be protected from draughts. Bedding requirements are as much as 50 per cent. higher, and hay consumption may also be greater than when the cows are tethered and stall-fed. (From summary.)—T. D. Bell.

2511

HALLEY, R. J. **The grazing behaviour of South Devon cattle under experimental conditions.** *Brit. J. Animal Behaviour*, 1953, **1**, 156-157. [Seale Hayne Agric. Coll., Newton Abbot, Devon.]

Pairs of cows grazed for 24 hr. at a time on 1/8-acre plots of ryegrass-dominant pasture containing different amounts of available dry matter. In general the time spent grazing varied inversely with the resting time and directly with the amount of dry matter available. The average time spent grazing was 6.54 hr. per 24 hr.—P. C. Jowsey.

2512

HIRSCHFELD, W. K. **Milk production and its dependence on food and genetic factors.** *Nederlands Melk Zuiveltijdschr.*, 1953, **7**, 129-137. [Zootech. Inst., Vet. Fac., State Univ., Utrecht.] Dutch summary.

2513

WARD, A. H. **Level of superphosphate topdressing and butterfat production per acre.** *Proc. N.Z. Soc. Animal Prod.*, 1953, **13**, 97-104 (with discussion 105). [N.Z. Dairy Board, Wellington.]

See also Absts. 1725, 1747, 1976, 2488, 2493.

REPRODUCTION

2514

FLIPSE, R. J., SNYDER, J. W., THACKER, D. L. and ALMQUIST, J. O. **Effect of total digestible nutrient intake on growth and reproductive development of dairy bulls.** *Pennsylvania Agric. Exp. Stat. Progr. Rep.* No. 104, May 1953, pp. 14. [State Coll., Pa.]

The rations of 4 groups of Holstein bulls were maintained during the first 2 years of life at 70,

100, 115 and 130 per cent. of the recommended allowances for total digestible nutrients. Records of sexual development, blood composition, growth and feed utilisation and semen quality were kept throughout the experimental period.

The age at which the first viable spermatozoa were obtained was delayed by 12 to 14 weeks in the group receiving only 70 per cent. of the recommended allowances when compared with the other groups. The semen obtained from the poorly fed animals was also of poorer quality.

Blood composition was not significantly affected by differences in intake of total digestible nutrients.

At 2 years of age bodyweights and heart girth measurements of the poorly fed group were significantly less and height of withers slightly less than those of the other groups. During the first 26 weeks the poorly fed animals utilised their feed less efficiently, but on the average over the 2-year period this group was most efficient.

J. N. Aitken.

2515

JOHNSTON, J. E. and BRANTON, C. **Effects of seasonal climatic changes on certain physiological reactions, semen production and fertility of dairy bulls.** *J. Dairy Sci.*, 1953, **36**, 934-942. [Dairy Dept., Louisiana State Univ., Baton Rouge.]

This investigation was made over a 53-week period in a sub-tropical environment with 14 dairy bulls of the Holstein, Jersey and Guernsey breeds. The physiological reactions studied were pulse rate, body temperature and respiration rate. Semen samples were collected and evaluated for quantity and quality. Fertility was estimated on the basis of percentage of 60 to 90 day non-returns to first services. Statistical analysis of results showed that differences in fertility or body temperature between breeds were not significant. There was a significant breed difference in pulse rate throughout maximum temperature intervals of 40° to 60°, 60° to 70°, 70° to 80°, 80° to 85°, 85° to 90° and 90° to 95° F. There was a significant correlation between fertility and minimum and maximum temperature and vapour pressure when 6-week moving averages of these measurements were taken.—J. N. Aitken.

2516

JOHNSON, L. E., ALBEE, L. R., SMITH, R. O. and MOXON, A. L. **Cows, calves, and grass. Effects of grazing intensities on beef cow and calf production and on mixed prairie vegetation on Western South Dakota ranges.** *S. Dakota Agric. Exp. Stat. Bull.* No. 412, June 1951, pp. 39.

Studies were made of the effect of heavy, medium and light grazing of range pasture on the state of

the pasture and on the cattle. The observations were continuous from 1942 to 1950. During the first 5 years stocking was, for heavy, light and medium rates, 1.4, 2.3 and 3.1 acres per cow per month, respectively. In the following 4 years rates were intensified to 1.4, 2.1 and 2.8. Grazing was for 7 months annually, all animals receiving the same treatment during the winter.

The heavier the grazing, the less the weight gain during the grazing period. In some years there was a loss in the heavy grazing group. Through the years the differences between groups increased progressively, since the same animals were kept in these groups throughout the experiment. There was no difference in

calf crops between groups, but weaning weights followed the same trends as the liveweights of the cows.

The yield of foliage increased in the lightly grazed areas, was maintained in the moderate and declined in the heavy. For lightly, moderately and heavily grazed, the percentages of foliage removed were 37, 46 and 63, respectively. Though heavy grazing produced the best cow and calf gains per acre, when set against the deterioration of the pasture the result was not considered advantageous, and the general recommendation is: "Graze half and leave half". The suggested rate of grazing is 2.25 acres per cow per month.—T. D. Bell.

SHEEP

2517

JORDAN, R. M., BURKITT, W. H. and WILSON, J. W. **Sorghum as a feed for lambs.** *S. Dakota Agric. Exp. Stat. Bull.* No. 417, February 1952, pp. 11.

Grain from grain-type sorghum (Norghum) had the following percentage composition: dry matter 91.17, crude protein 12.15, ether extract 2.79, crude fibre 1.78, N-free extract 72.97, and compared favourably with maize. Grain from sweet sorghum had less N-free extract and more fibre.

In 3 trials with comparable groups of lambs, average daily gains were with maize 0.27, grain sorghum 0.22, sweet sorghum 0.18 lb. per head. A good deal of sorghum grain passed through the lambs whole, but the digestibility compared favourably with that of maize. Grinding the sorghum is unnecessary and uneconomical.

The grain was highly palatable and should be used where the sorghum crop is more reliable and yields more heavily than maize.—P. C. Jowsey.

2518

DICK, A. T. **Influence of inorganic sulphate on the copper-molybdenum interrelationship in sheep.** *Nature*, 1953, 172, 637-638. [Div. Animal Health Prod., Animal Health Res. Lab., C.S.I.R.O., Parkville, N. 2, Victoria, Australia.]

In sheep on a diet of chaffed alfalfa hay and chaffed oat hay, Mo intake limited storage of Cu in the liver. The effect was greater when the diet consisted of chaffed alfalfa hay, and was not observed in sheep on a diet of oat hay. The difference between these hays in their effect on the control of Cu storage by Mo was shown to be due to their different contents of inorganic sulphate. Alfalfa hay contained about 0.3 per cent., about 10 times the amount in oat hay.—F. C. Aitken.

2519

COOP, I. E. **Wool growth as affected by nutrition and by climatic factors.** *J. Agric. Sci.*, 1953, 43, 456-472. [Canterbury Agric. Coll., Univ. New Zealand.]

Groups of wet and dry ewes were used to study the effect of nutrition and season on wool growth. The weight, length and diameter of wool were estimated at monthly intervals. Some of the ewes were maintained on pasture and some in stalls, at sub- or super-maintenance levels. The observations were made for 3 years, and were considered in 4-monthly periods, pregnancy, lactation and the period from weaning to mating. Feeding levels were changed according to these periods. The wet ewes lambed in the spring.

There was a definite seasonal rhythm in the growth of wool, which was a maximum in summer and reduced to about a third in the winter. Reduction in weight of wool was due to reduction in both length and diameter. The amplitude of the seasonal variation was influenced by the level of nutrition, but the variation could not be eliminated. The reproductive cycle modified the effect of nutrition. In wet ewes the nutritional demands of pregnancy tended to reduce the rate of wool growth, and those of lactation delayed the rise, compared with dry ewes on the same level of nutrition at the same period. Within limits the level of nutrition modified the maximum and minimum of wool growth. There was no correlation between gain or loss of effective liveweight and wool growth. Subsidiary experiments on light and environmental temperature showed that these had a slight effect on wool growth, but did not eliminate the seasonal variation.—T. D. Bell.

2520

COOP, I. E. and HART, D. S. **Environmental factors affecting wool growth.** *Proc. N.Z. Soc.*

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Animal Prod., 1953, **13**, 113-119 (with discussion 120). [Canterbury Agric. Coll., Lincoln.]

2521

CHOMYSZYN, M. and BIELIŃSKI, K. Wypas wybrakowanych owiec-matek. [Feeding of culled ewes.] *Rocz. Nauk rol. [B]*, 1953, **66**, No. 3, 43-56. Russian and English summaries.

Culled ewes were fed on pasture for 90 days, one group receiving 530 g. ground barley per head daily. At the beginning of the experiment 3 animals, and after 1, 2 and 3 months 2 animals from each group were killed and carcass quality was estimated. The group receiving no supplement gained 7.2 kg. in 60 days, and 7.3 kg. in 90 days. For the other group the figures were 5.6 and 6.9. There was no appreciable difference between groups or between periods in carcass quality. Utilisation of the pasture was poorer when the supplement was given. It is suggested that the grazing period could be shortened to 2

months, since there is little gain during the last month. (From summary.)—T. D. Bell.

2522

MEREGALLI, A. I risultati dei controlli funzionali negli ovini sardi per le annate 1949-50 e 1950-51. [Results of milk recording of Sardinian ewes during 1949-50 and 1950-51.] *Riv. Zootec.*, 1953, **26**, 268-269.

The number of sheep recorded in the Sarda flockbook at Cagliari is increasing, and new breeding centres are entering. As a result the performances recorded for 1950-51 are not so good as those for 1949-50, because selective breeding at the new centres has not progressed so far as at the old. There is considerable improvement on previous years, however. Milk yield and fat percentage are increasing, and selection of ewes for these characteristics is systematically practised. Recording of the performance of rams has also been initiated and this will lead to further efficiency from selective breeding.—T. D. Bell.

See also Absts. 2196, 2203.

PIGS

2523

YOUNG, G. A. and UNDERDAHL, N. R. Isolation units for growing baby pigs without colostrum. *Amer. J. Vet. Res.*, 1953, **14**, 571-574. [Hormel Inst., Univ. Minnesota, Austin.]

The apparatus and technique, which have been used to raise 150 pigs from birth to 4 weeks of age without colostrum, are described. The possible usefulness of the isolation units for the study of disease, nutritional requirements of baby pigs, genetic capacity for growth at early ages and disease control are discussed.—T. D. Bell.

2524

ALEXANDROWICZ, S., FOLEJEWSKI, W. and SZYPOWSKI, A. Stosowanie balkonów pomostów dla prosiąt ssących. [The use of balcony-gangways for sucking pigs.] *Rocz. Nauk rol. [B]*, 1953, **66**, No. 1, 83-96. [Zespół Kat. Produkcji Zwierzęcej W.S.R., Poznań.] Russian and English summaries.

Suckling pigs reared in pens with balcony-gangways above the sows grew and developed better than those provided only with small coops. The system is illustrated and described. The rate of liveweight increase was significantly greater, and Hb level was higher. The balconies also saved housing space. The advantages are attributed to the better access to light, the warmer, drier floor and more exercise. (From summary.)

T. D. Bell.

2525

GIULIANI, R. Le esigenze nutritive dei suini secondo le attuali conoscenze nel campo della

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nutrizione animale. 3. [Nutritive requirements of the pig according to present knowledge in the field of animal nutrition. 3.] *Riv. Zootec.*, 1953, **26**, 342-345.

2526

GREGORY, K. E. and DICKERSON, G. E. Influence of heterosis and plane of nutrition on rate and economy of gains, digestion and carcass composition of pigs. *Missouri Agric. Exp. Stat. Res. Bull.* No. 493, April 1952, pp. 48. [Columbia, Mo.]

As previous experiments had shown that heterosis in pigs increases growth rate but also increases appetite, it was desirable to study the effects of heterosis independently of feed consumption. The object of the experiment reported was to learn how heterosis affects rate and economy of gain and carcass quality under full feeding and when the feed intake of the crosses is restricted to that of the parent strains. During the experiment data were also obtained on digestibility and the general effects of limited feeding.

Limiting the feed intake to 87 per cent. of full feeding had no detectable effect on digestibility of dry matter, but reduced daily gains and decreased the feed required per unit of gain. The limited-fed pigs carried more lean meat and less fat, but had lower dressing percentages. The financial benefit of improved carcass quality was counteracted by this lower yield of dressed carcass.

When their feed consumption was limited to that of the parent strains the linecross and top-cross pigs grew from 13 to 26 per cent. faster and

from 9 to 19 per cent. more economically than the parent strains. The topcross pigs had better carcass qualities than the mean of the parent lines, for they carried more muscle and less fat.

When feed consumption was unrestricted, hybrid vigour expressed itself in greater feed consumption and more rapid and economical gains.

Breed had no effect on the digestibilities of the rations.—I. Lucas.

2527

VERBEEK, W. A. **New method of feeding pigs cheaply.** *Farming in S. Africa*, 1953, **28**, 311–312. [Dept. Animal Husb., Potchefstroom Coll. Agric.]

The method is to hand-feed 2 lb. per pig daily of a high-protein mixture (25 per cent. crude protein and 3 per cent. fibre) containing animal protein, and supply a high-fibre mixture (12 per cent. crude protein and 11 per cent. fibre) to appetite in self-feeders. The pigs need only be fed once a day, so there is a saving on labour, and it is claimed that the method produces good lean pork carcasses and ensures full utilisation of the expensive protein concentrates.—T. D. Bell.

2528

WUSSOW, W., WENIGER, J. H. and SCHUMM, H. R. Die Wirkung einer APF-Beigabe auf Futterverwertung und Schlachtleistung bei Schweinen. [Effect of an APF supplement on feed utilisation and carcass weight of pigs.] *Arch. Tierernährung*, 1953, **3**, 223–239. [Inst. Tierzucht, Martin Luther Univ., Halle, Wittenberg.]

The animal-protein factor supplement was Beta-meal, a by-product from the manufacture of fish-meal. The basal ration consisted of 300 g. barley meal, 400 g. ground oats, 300 g. wheat bran and potatoes to appetite. Eight groups of 4 pigs each were fed from 40 to 130 kg. liveweight, some control animals being killed at the start for carcass analyses. The 8 groups received the basal ration alone or with 80 or 40 g. Beta-meal, 200 g. yeast alone or with 40 g. Beta-meal, 300 g. peameal alone or with 40 g. Beta-meal, and 150 g. meat-meal.

The greatest daily liveweight gain was shown in all the groups receiving the Beta-meal and there was no significant difference between the results with 80 and 40 g. Apart from the meatmeal group the feed intake per kg. liveweight gain was lowest when Beta-meal was given. The slaughter tests and analysis of the carcasses showed a better feed utilisation with Beta-meal. In the internal organs the only effects noted were an increase in liver weight and length of the large intestine in the Beta-meal group animals. These results are in agreement with earlier findings of Fischer

(*Tierzucht*, 1951, p. 32) and Stahl *et al.* (*ibid.*, 1952, p. 155).—W. Godden.

2529

HANSON, L. E., BAKER, M. L., BAKER, G. N. and RUMERY, M. G. A. **Distillers solubles in market pig rations.** *Nebraska Agric. Exp. Stat. Bull.* No. 415, November 1952, pp. 19.

The literature is reviewed and 7 feeding trials are reported.

In 2 trials distiller's solubles successfully replaced part or all of the tankage in rations containing soya bean meal and 5 or 10 per cent. alfalfa. In the next 3 trials solubles were used as a substitute for alfalfa meal, soya bean meal or tankage, or as a supplement to a mixture of these. The solubles were satisfactory when replacing soya bean meal or tankage, but not alfalfa meal, especially when this was of high grade. As an addition to the mixture, solubles had no advantage. The last 2 trials used the same protein mixtures as the previous 3, mixed with yellow maize, to supply rations of equal protein content. Rates of gain were similar in all groups, but were not considered satisfactory.—T. D. Bell.

2530

BREIREM, K., HUSBY, M. and HVIDSTEN, H. Varmedbehandling av soyamel og soyakakemel. [Heat treatment of soya bean meal and soya bean cake meal.] *Tidsskr. norske Landbruk*, 1953, **60**, 227–241. [Landbrukshøgskole.] English summary.

In Norway "soyamel" commonly means the residue from solvent extraction with about 1 per cent. fat and "soyakakemel" the residue from pressure extraction with about 5 per cent. fat. Published reports on the effect of heat in each process are reviewed. An experiment is described (part of a series to be published) with 5 groups of pigs on a cereal ration with cod liver oil and a salt mixture; as protein 3 had herring meal with or without herring solubles, 1 had 80 per cent. solvent-extracted soya meal with 20 per cent. fish solubles and the last solvent-extracted meal alone. Slaughter weight was 90 kg. Daily weight gains, corrected to 75 per cent. of slaughter weight, were 701 g. for the 3 herring meal groups together, 578 g. for the soya and fish solubles and 523 for soya alone. A second similar experiment gave similar results. In a third test herring meal, solvent-extracted soya meal as bought, and the same after cooking for 20 min. like porridge, and American expeller-process meal were compared. The pigs on soya meal alone lost appetite and did not reach 90 kg. slaughter weight. Corrected daily gains in the above order were 636, 493, 565 and 616 g. and feed consumption per unit gain

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varied inversely with rate of gain. It is suggested that Norwegian soya meals do not have sufficient heat applied in the milling process and that additional boiling for 20 min. is also insufficient.

I. Leitch.

2531

FAGAN, V. J., GIBLIN, A. G. and HOOPER, R. M. **Pig raising—experimental work. 2. Tasmanian J. Agric.**, 1953, **24**, 221–229. [Cressy Res. Farm.]

For part 1 see Abst. 3715, Vol. 23.

An experiment was made to test the value of penicillin in increasing the growth rate of normal weanling pigs on a normal ration. Groups of 10 pigs were used and the treatment was continued for 100 days. Group 1 had $\frac{1}{4}$ oz. procaine penicillin per 10 pigs daily; group 2 the same with an intramuscular injection of 1 ml. vitamin B₁₂ at the start of the experiment; half of group 3 had an initial intramuscular injection as in group 2, but no penicillin, and the other half had an initial injection of 2 ml., repeated monthly, and no penicillin. Group 4 acted as control, receiving the normal ration of crushed wheat and meatmeal to appetite, and skimmed milk.

The penicillin increased the appetite of the pigs, but no significant difference in rate of gain or efficiency of feed utilisation was observed between groups, and general health was the same. Conditions under which spectacular results from the use of antibiotics should not be expected are outlined.

In the second experiment there were 2 groups, one receiving swill and barley, and the other swill and barley plus $\frac{1}{4}$ lb. meatmeal per head daily. There were 8 weanling pigs in each group, and the trial lasted 72 days. The pigs receiving meatmeal gained faster than the others, but the difference was not significant. The experiment was repeated with 2 more groups of pigs fed for 60 days, with confirmatory results.

The economics of giving dry crushed or whole wheat from weaning to bacon weight was investigated in a trial with Berkshire sows and boars. Two groups of 6 pigs each received $\frac{1}{4}$ lb. meatmeal per head daily and wheat to appetite. For 1 group the wheat was crushed in a hammer mill, and this group gained faster than the whole wheat group. Even when the cost of crushing was set against that group, the financial return was greater.—T. D. Bell.

2532

GERI, G. *Appropriata alimentazione proteica dei suini. [Correct protein allowances for pigs.] Riv. Zootec.*, 1953, **26**, 330–331.

A report of the experiment described in Abst. 1320, Vol. 24.—T. D. Bell.

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2533

ZNANIECKI, P. Tucz trzody chlewnej paszą pochodzenia wyłącznie roślinnego. [Fattening of pigs with plant food only.] *Rocz. Nauk rol. [B]*, 1953, **66**, No. 1, 45–82. [Inst. Zootech. Z. D. Czechnica.] Russian and English summaries.

Comparison was made between groups of pigs receiving animal or plant protein. On plant protein only resistance to disease was reduced, efficiency of feed utilisation and rate of liveweight increase were less, and protein was not used so efficiently. There was not much difference in carcase quality, but there was greater variation within the group fattened on plant protein. (From summary.)—T. D. Bell.

2534

ALEXANDROWICZ, S., BENEDYKOŃSKI, S. and KRAUPE, W. Wykorzystanie obierzyn ziemniaczanych zakiszonych z odpadkami kuchennymi w tuczu przemysłowym trzody chlewnej. [Utilisation of potato peelings as silage with kitchen waste in the industrial fattening of pigs.] *Rocz. Nauk rol. [B]*, 1953, **66**, No. 3, 115–119. [Kat. Szczegółowej Hodowli Zwierząt W.S.R., Poznan.]

2535

SZAWIŃSKI, A. Pastwiska dla trzody chlewnej na Śląsku Cieszyńskim. [Pastures for swine in Cieszyn Silesia.] *Rocz. Nauk rol. [B]*, 1953, **66**, No. 1, 5–44. [Russian and English summaries.]

Well-manured permanent pasture can supply 50 per cent. of the protein requirements of growing pigs, and 80 per cent. for fattening. Sows in early pregnancy can be maintained without supplements. The composition and use of pastures in Silesia were studied, and the results are reviewed. (From summary.)—T. D. Bell.

2536

GUNNING, O. V. Apples as a pig food. *Brit. Vet. J.*, 1953, **109**, 479–481.

No references have been found to substantiate the popular claims that apples are harmful to pigs. They may have no place in fattening, but breeding gilts on pasture in an orchard, given a small ration of dry meal and eating up to 20 lb. a day of apples, thrive and farrowed normally. For a short period they were fed indoors. Nursing was satisfactory, and the litters also utilised the apples well without ill effect.—T. D. Bell.

2537

Pig feeding. *Minist. Agric. and Fish. Advisory Leaflet* No. 104, September 1953, pp. 8. H.M.S.O., London. Price 2d. net.

The general principles of profitable pig feeding for bacon or pork production are outlined, with notes on the care of breeding sows and the use of antibiotics.—T. D. Bell.

2538

Gli antibiotici nell'alimentazione dei suini. [**Antibiotics in pig feeding.**] *Riv. Zootec.*, 1953, **26**, 295.

A short review.

2539

BEESON, W. M., PERRY, T. W. and REYNOLDS, P. J. **The effect of surfactants on the growth rate of swine.** *J. Animal Sci.*, 1953, **12**, 619-622. [Dept. Animal Husb., Purdue Univ. Agric. Exp. Stat., Lafayette, Ind.]

Two trials were made with Duroc weanling pigs. In the first the addition of 0.1 per cent. Ethomid C-15 to a basal ration had little effect on growth rate.

In the second trial the addition of 0.2 per cent. alkyl benzene sulphonate produced a significant increase in growth rate over a control group and the rate of growth was similar to that of a group receiving 7.5 mg. aureomycin per lb. feed. Lower levels of alkyl benzene sulphonate had no significant effect on growth.—J. S. Thomson.

2540

HEADY, E. O., WOODWORTH, R. C., CATRON, D. and ASHTON, G. C. **An experiment to derive productivity and substitution coefficients in pork output.** *J. Farm Econ.*, 1953, **35**, 341-351. [Iowa State Coll.]

Duroc and Duroc \times Landrace \times Poland pigs, 192 in all, were fed from about 40 lb. to 200 lb. weight on rations containing different proportions of No. 2 yellow maize and soya bean meal, with 500 mcg. vitamin B₁₂ per 100 lb. soya bean meal, and with or without 500 mg. aureomycin per 100 lb. feed. All rations contained, per 100 lb., bone-meal 3 lb., CaCO₃ 0.6 lb., trace minerals 0.1 lb. and vitamins 10 g. The pigs were weighed fortnightly and gains and feed intakes were recorded.

Two types of equation were fitted to the data, Y , the weight gain, being expressed either as a quadratic function of C and P , the respective amounts of maize and soya bean, or as a Cobb Douglas function of the form aC^bP^c , which logarithmic transformation renders linear. The equations of both types are given for rations with or without aureomycin for the ranges 40 to 75, 75 to 150 and 150 to 200 lb. and for the overall range. From these the marginal pork production from an extra pound of one feed when the other feed is (1) increased in the same proportion or (2) held constant is obtained by differentiation. Derived

tables are given showing the total gains and marginal gains for rations in fixed proportions with 12, 14 and 16 per cent. protein and with or without aureomycin, and for different total maize intakes with total protein intakes of 52 and 112 lb. Further equations are given from which can be found all possible combinations of the 2 feeds which will produce a given gain, and from these, again, substitution equations are obtained by differentiation. A derived table shows the combinations of protein and maize and the marginal rates of substitution of protein for maize for pigs weighing 60 and 75 lb., with aureomycin. In general, aureomycin reduced the quantity of both feeds required per 100 lb. gain, but its effect on the maize-protein substitution rate was not established.

Finally, although the main object of this report was to demonstrate the usefulness of co-operation between animal nutrition experts and production economists, the question arises how the results are to be presented to the farmer. A simple clock-face diagram for this purpose is illustrated.

Fuller details will be published later. A study of carcass composition on the different rations is in progress.—W. M. Deans.

2541

BISHOP, G. R. H. **Breeding for bacon production.** *Minist. Agric. and Fish. Bull.* No. 158, H.M.S.O., London, 1953, pp. iv + 27. Price 1s. 9d. net.

General advice is given on selection, breeding and management for the production of bacon carcasses. Feeding is discussed only in general terms. The snags of selection for particular characters are pointed out, and the importance of the boar as well as the female stock is stressed. The advantages of pure breeds and crosses are discussed. There is a constant cry for the establishment of an efficient recording and testing scheme, the *sine qua non* of any successful development of bacon production based on selection.—T. D. Bell.

2542

SMITH, W. **Pork production.** *Agriculture, J. Minist. Agric. Engl.*, 1953, **60**, 355-357. [Nat. Agric. Advisory Serv., E. Province.]

General principles for selection, rearing, feeding and management for the production of pork carcasses of 5 to 7 score are outlined.—T. D. Bell.

2543

ZNANIECKI, P. **Różne metody tuczu świń. [Different methods of fattening pigs.]** *Rocz. Nauk rol. [B]*, 1953, **66**, No. 1, 127-174. Russian and English summaries.

A review.

2544

PARTANEN, J. Sikakantoja vertailevien kokeiden tulokset vuodelta 1951. [**Results of pig recording in Finland in 1951.**] 1953, pp. 24. [Tikkurila.] German summary.

In this scheme normally 2 gilts and 2 boars from a litter were sent to the experimental station when they were about 2 months old and weighed 15 to 20 kg. All pigs were then fed and housed alike and were slaughtered at about 90 kg. weight. The results from 265 Yorkshire, 42 Finnish Landrace and 8 Yorkshire \times Landrace pigs are reported. Losses of weight at slaughter were 24.6, 24.2 and 26.5 per cent., average daily liveweight gains over

the interval 20 to 88 kg. were 709, 733 and 772 g. and average feed requirements per kg. liveweight gain over the period were 3.27, 3.11 and 3.18 feed equivalent units (Hansson). Carcasses were graded for hardness, distribution and thickness of back fat and quality of belly muscle and hams, as well as being given points for liveweight gain and feed consumption. Of the 265 Yorkshire pigs 231 were graded class 1, 15 class 2, 4 class 3 and 15 class 4. For the 42 Landrace pigs the figures were 30, 6, 2, 4, and all the crossbreeds were graded class 1. (From summary.)—W. Godden.

See also Absts. 1779, 1843.

GOATS, RABBITS AND OTHER MAMMALS

2545

PACHECO JORDAO, L. and CALDAS FILHO, C. F. Aspectos da eficiência reprodutiva dos caprinos, em São Paulo. [**Aspects of breeding efficiency of goats in São Paulo.**] *Bol. Indúst. animal, São Paulo*, 1952, **13**, 79–97. [Div. Zootec. Nutrição Animal.] English summary.

The goat population of Brazil at the 1940 census was 6.5 million on 361,000 farms. São Paulo had 139,000 on 30,000 farms. In 1950 the goat population of São Paulo was nearly 384,000. In the east and north of the country the goats are kept mostly for skins and meat; in the centre and south milk also is produced. The Department of Animal Production of São Paulo has registered 20 proprietors of 278 goats, mostly Toggenburg, which produce milk for sale in the capital. Mean daily yield is about 1 litre.

The breeding data discussed refer to 1176 goats, of which 589 were of indigenous breeds and crosses and the rest Toggenburg and Anglo-Nubian purebred and crosses and a few purebred Saanen and Angora.

Of purebred goats bred during the usual season, August to December or January, 71.2 per cent. conceived; outside this season, 78.7. For crosses the figures were 85.3, 93.8. Services per conception in the same order were 1.40, 1.27, 1.17 and 1.07. The mean number of young per gestation was 1.76.

I. Leitch.

2546

EATON, O. N., SIMMONS, V. L., SYKES, J. F., WRENN, T. R. and HALL, S. R. **A study of the effect of stilbestrol induced lactation on dairy goats.** *J. Dairy Sci.*, 1953, **36**, 1089–1096. [Bur. Animal Indust., U.S. Dept. Agric., Washington, D.C.]

The purpose was to determine whether the future performance of dairy goats could be predicted from an early induced lactation.

Female Toggenburg kids born into the goat

herd of the Bureau of Animal Industry were divided into 2 groups. When the kids of 1 group were 13 to 16 months of age subcutaneous injections of 0.5 mg. diethylstilboestrol in 1 ml. oil were administered 3 times weekly for 50 days. The other group was untreated.

Twice-a-day milking was begun when production reached 1 lb. daily and was discontinued when it fell below this amount. The animals of both groups were bred in the autumn whenever oestrus was evident. The response to treatment was variable. The best producers were in lactation for 5 to 6 months. Some animals did not respond. Lactation curves for the induced lactation resembled those for a normal lactation, except that production was at a lower level. In general animals which were good producers under induced lactation proved to be good producers in their natural lactations.

It is concluded that extremely high and extremely low producers can be identified with a high degree of certainty.—J. N. Aitken.

2547

TEMPLETON, G. S. **Effects of certain methods of feeding and managing rabbits in commercial fryer production.** *U.S. Department of Agriculture Circular No. 901*, March 1952, pp. 16. [U.S. Rabbit Exp. Stat., Fontana, Calif.]

Forty-eight New Zealand white does and their 278 litters of 2107 young were studied over 19 months. From weaning at 2 months until they were mated and placed on test at 6 months, the young of both sexes were given daily 2½ oz. stock pellets and alfalfa hay to appetite. The stock pellets contained, in lb., soya bean meal 500, linseed meal 100, alfalfa meal 1200, mill run 400, barley 500, oats 100 and salt 15. The percentage composition was: crude protein 20.8, fat 3.7, fibre 15.1 and minerals 6.8. Herd bucks were continued on the same rations but does received

the hay only for about 14 days after mating. For the rest of the gestation period they received 4 oz. pellets daily and alfalfa hay to appetite.

Hopper and hand feeding were equally satisfactory and the former saved labour. With both methods the young weighed on the average 3.89 lb. at 56 days of age. From birth to 56 days, 22 per cent. of the young died, and a further 2.77 per cent. died between the 57th and 64th days.

From time of mating until the litters were weaned at 56 days, 4 lb. feed were required to

produce 1 lb. fryer and 5.39 lb. feed to produce an additional pound from the 57th to the 64th day.

P. C. Jowsey.

2548

WOLCOTT, G. N. **The food of the mongoose (*Herpestes javanicus auro-punctatus* Hodgson) in St. Croix and Puerto Rico.** *J. Agric. Univ. Puerto Rico*, 1953, **37**, 241-247. [Dept. Entomol., Agric. Exp. Stat., Univ. Puerto Rico, Río Piedras.] Spanish summary.

POULTRY

GROWTH AND FATTENING

2549

ASMUNDSON, V. S. and PUN, C. F. **Growth of Bronze turkeys.** *Poultry Sci.*, 1953, **32**, 887. *Proc.* [Univ. California, Davis.]

2550

MILBY, T. T. and SHERWOOD, D. H. **The effect of restricted feeding on growth and subsequent production of pullets.** *Poultry Sci.*, 1953, **32**, 916. *Proc.* [Larro Res. Farm, General Mills, Inc., Detroit, Mich.]

2551

DYMSZA, H., BOUCHER, R. V. and MCCARTNEY, M. G. **Response of growing turkeys to variations in the fiber and energy content of mash and pelleted diets.** *Poultry Sci.*, 1953, **32**, 898. *Proc.* [Pennsylvania State Coll., State College.]

2552

SLINGER, S. J., HAUSER, M. M. and PEPPER, W. F. **The correlation between feed consumption and fecal flora in chicks.** *Poultry Sci.*, 1953, **32**, 925. *Proc.* [Ontario Agric. Coll., Guelph.]

2553

TITUS, H. W., MEHRING, A. L. (Jr.) and BRUMBAUGH, J. H. **Variation of feed conversion.** *Poultry Sci.*, 1953, **32**, 1074-1077. [Lime Crest Res. Lab., Limestone Products Corporation of America, Newton, N.J.]

(The authors suggest that the term "feed efficiency" or "efficiency of feed utilisation" of a growing animal should mean the weight gain per unit weight of feed consumed. "Feed conversion" should be used as the reciprocal expression, the feed required per unit weight of gain made.)

A statistical study was made of 20 feeding experiments with duplicated groups, each containing 20 New Hampshire chicks. They were kept from day-old to 5 weeks of age in battery brooders in an air-conditioned room at 75° F. and were

then transferred to a battery in a room at 70° F. until they were 10 weeks old.

Only in 2.5 per cent. of the 156 groups considered did mortality exceed 3 per group. In 6 per cent. of the duplicate lots the difference between the feed conversion efficiencies exceeded 0.35, and in 17 per cent. it exceeded 0.2. The standard deviation of feed conversion to the age of 10 weeks for small groups of chicks (17 to 20) was estimated to be 0.1.—K. J. Carpenter.

2554

FISHER, H., SINGSEN, E. P. and MATTERSON, L. D. **The influence of feed efficiency on the phosphorus requirement for growth and bone calcification in the chick.** *Poultry Sci.*, 1953, **32**, 749-754. [Poultry Dept., Storrs Agric. Exp. Stat., Univ. Connecticut.]

Two rations of similar constitution but providing 968 and 683 Cal. per lb. were each given to 6 groups of 25 day-old New Hampshire × Barred Rock male chicks with 6 different levels of P, namely, 0.24, 0.35, 0.40, 0.45, 0.50 and 0.60 per cent. The basal rations contained similar amounts of Ca and P and a Ca : P ratio of 2 : 1 was always maintained by supplying lime with the extra NaH_2PO_4 .

The bone ash (left tibia) of 7 birds from each group was estimated at 2 and 4 weeks of age and indicated that the birds receiving the high-energy ration were utilising the feed P more efficiently; 0.51 per cent. P in the high-energy ration allowed as good calcification as 0.58 per cent. P in the low-energy ration. Increasing the P content of the ration had no effect on liveweight increase. Data on blood P values are recorded.—M. J. Head.

2555

WILCOX, R. A., CARLSON, C. W., KOHLMAYER, W. and GASTLER, G. F. **Calcium and phosphorus requirements of poults fed purified diets.** *Poultry Sci.*, 1953, **32**, 1030-1035. [Dept. Poultry Husb., S. Dakota Agric. Exp. Stat., College Station.]

Day-old Beltsville Small White Turkey poult were used to 4 weeks of age. The basal purified ration contained all the known poult nutrients in excess of known requirements, except Ca and P, which were provided at levels of 0.04 and 0.03 per cent., respectively.

In the first series of trials, the Ca level was raised to 2 per cent. and the P level ranged from 0.4 to 1.6 per cent. A supplement of 2 per cent. dried buttermilk produced increased growth over the purified rations, and an additional supplement of 1 per cent. forage juice increased this even further. On all diets the percentage bone ash rose with P supplementation up to the 1.2 per cent. level but then fell slightly. Generally, percentage bone ash was higher in birds receiving dried buttermilk and higher still in those receiving forage juice as well.

In the second series, both supplements were given to all groups; the P levels ranged from 0.6 to 1.2 per cent. and the Ca levels from 1.0 to 3.0 per cent. Maximum growth was obtained with 2 per cent. Ca and 1 per cent. P, but maximum bone ash was obtained with 1.3 per cent. Ca and 0.8 per cent. P.

In all experiments, a feed efficiency of 1.66 was found for the purified rations and of 2.05 for a ration of practical type used at the same time.

M. J. Head.

2556

O'NEIL, J. B. and SPINKS, J. W. T. **The relationship between the density of the fresh egg and calcium uptake in the chick.** *Poultry Sci.*, 1953, **32**, 919. *Proc.* [Univ. Saskatchewan, Saskatoon.]

2557

HEYWANG, B. W., BIRD, H. R. and KEMMERER, A. R. **The level of protein in the diet of growing New Hampshire chickens during hot weather.** *Poultry Sci.*, 1953, **32**, 781-785. [Agric. Res. Admin., U.S. Dept. Agric., Bur. Animal Indust., Glendale, Ariz.]

Experiment 1 was made at average daily maximum, minimum and mean temperatures of 102°, 76° and 89° F. Increasing amounts of soya bean oil meal were added to the rations of groups of 100 day-old New Hampshire chicks to give total protein contents of 20.1, 22.3, 24.3, 26.5 and 28.5 per cent. The average group liveweights to 10 weeks of age were 867, 914, 942, 958 and 946 g., with feed efficiencies 0.346, 0.358, 0.352, 0.330 and 0.312, respectively. Experiments 2 and 3 were made at average daily maximum, minimum and mean temperatures of 100° and 100° F., 71° and 72° F. and 86° and 85° F. Increasing amounts of sardine meal and casein were added to the rations of groups of 60 chicks to give total protein contents of 20.3, 22.6, 24.8, 26.9 and 29.1 per cent. The

liveweights at 10 weeks of age in experiment 2 were 914, 917, 929, 979 and 952 g., with feed efficiencies of 0.434, 0.446, 0.450, 0.478 and 0.463, respectively. In experiment 3 the average group liveweights were higher than in experiment 2, but feed efficiencies were lower at 0.394, 0.399, 0.432, 0.433 and 0.432. Experiment 4 was made in cool weather with average daily maximum, minimum and mean temperatures of 72°, 46° and 59° F. The rations were similar to those in experiments 2 and 3 but average group liveweights at 10 weeks of age were 1374, 1382, 1430, 1353 and 1387 g., with feed efficiencies of 0.408, 0.414, 0.413, 0.416 and 0.406, respectively.

No conclusion was drawn about the effect of hot weather on the optimum protein content of the ration. High temperatures had an adverse effect on feed consumption and weight increase.

M. J. Head.

2558

BALDINI, J. T., ROSENBERG, H. R. and WADDELL, J. **Low protein diets for the turkey poult.** *Poultry Sci.*, 1953, **32**, 888. *Proc.* [Stine Lab., E.I. du Pont de Nemours and Co., Inc., Newark, Del.]

2559

ACKERSON, C. W. and MUSSEHL, F. E. **The utilization of food elements by growing poults. 2. A comparison of diets containing 25 and 30 percent. protein.** *Poultry Sci.*, 1953, **32**, 958-960. [Dept. Agric. Chem., Univ. Nebraska, Lincoln.]

The individual birds in groups of 32 day-old Beltsville Small White poults were given pelleted rations containing 24 or 30 per cent. protein. Each bird was killed after it had consumed 900 g. feed and the carcass was analysed for N, Ca and P. The poults on the 30 per cent. protein ration ate their feed in a shorter time and put on more weight than those on the 24 per cent. protein ration, but the latter utilised N, Ca and P more efficiently. The average N, Ca and P contents of a 5-week old poult were 3.30, 0.96 and 0.63 per cent., respectively.—M. J. Head.

2560

MENGE, H., DENTON, C. A., BIRD, H. R. and COMBS, G. F. **Effect of supplemental DL-methionine and varying protein levels on growth and feed requirements of broiler chickens.** *Poultry Sci.*, 1953, **32**, 827-836. [Bur. Animal Indust., U.S. Dept. Agric., Beltsville, Md.]

Similar experiments were made at 2 centres with 90 and 60 chicks per group, respectively.

The first part of the experiment covered the period from 0 to 6 weeks of age. Four groups of males, 4 of females and 2 of mixed sex were given a maize and soya bean type ration (A) with 22.4

per cent. crude protein with or without 0.05 per cent. DL-methionine. The supplement improved growth rate by about 5 per cent. and feed efficiency by 0.08 of a unit for males and females at both centres.

In the second part of the experiment, from the sixth to tenth week of age, the 5 groups that had received no methionine were redistributed on the basis of weight at 5 weeks into equal groups of both sexes. Each group then received the following rations: (1) ration (A); (2) ration (A) for 2 weeks, then a ration with 19.1 per cent. protein (B) for 2 weeks; (3) ration (B); (4) ration (A) for 2 weeks, then a ration with 15.8 per cent. protein (C) for 2 weeks; (5) ration (C). The groups receiving methionine were similarly redistributed. The overall effect of the methionine continued into this part of the experiment at only one centre, although chicks and feed from the same lot were used at both centres. Taking both centres together, no difference in average group gain was observed from the DL-methionine supplement, but feed efficiency was slightly improved. Growth rate was not affected by reducing the protein content of the ration to 15.8 per cent. during the sixth to eighth week, but feed efficiency was reduced. From the eighth to tenth week reduction of protein to 19.1 per cent. had no effect on growth; the highest feed efficiency was observed in those groups that were changed to this level of protein in the previous 2 weeks. Alteration in the total crude protein of the ration had no effect on the value of a methionine supplement. Comparison between sexes showed that males required a higher level of dietary protein for optimum growth from the eighth to tenth week than females.

M. J. Head.

2561

MATTERSON, L. D., DECKER, L., SINGSEN, E. P., KOZEFF, A., WADDELL, J., HASBROUCK, C. J., BIRD, H. R., MENGE, H. and RUNNELS, T. D. **The value of supplemental methionine in practical chick starter and broiler rations.** *Poultry Sci.*, 1953, **32**, 817-826. [Storrs Agric. Exp. Stat., Conn.]

Similar experiments, with feed and chicks from the same lot, were made at 3 centres on a basal ration with supplements of 0, 2.5 and 5 per cent. menhaden fishmeal and 0, 1, 1.25 and 1.5 [unit not given] methionine per ton feed in a randomised block design. The results showed that between centres the weights of the birds in comparable groups were significantly different although the responses to the supplements were similar. Additional methionine to 8 weeks of age improved feed efficiency but had a variable effect on growth. Increasing the fishmeal to 2.5 per cent. improved both growth and feed efficiency, but the presence of fishmeal had no influence on the supplementary

effect of methionine. The effect of the methionine supplement was greater in chicks reared on a floor with litter than in those reared in a battery.

In 3 further experiments with supplements similar to those above but with different basal rations, the results showed different effects. A basal ration similar in composition to that in the above collaborative test but with ingredients from a different source produced a greater liveweight increase when supplemented with DL-methionine as above than without. The 1949-1950 New England College Conference high-energy ration had a similar effect, but the Connecticut Broiler Ration had not, although the feed efficiency was improved when it was supplemented with DL-methionine.—M. J. Head.

2562

FANGAUF, R. and BARLÖWEN, G. v. **Methionin-zugaben im Kükenfutter. [Supplements of methionine in chick rations.]** *Arch. Geflügelk.*, 1953, **17**, 269-273. [Lehranst. Kleintierzucht, Kiel, Steenbek.] English summary.

In continuation of previous work (*Deutsche Wirtschaftsgeflügelzucht*, 1952, **4**, 149) 5 groups each of 30 day-old New Hampshire chicks were reared to 8 weeks on all-mash rations: (1) control, coarsely ground maize 30, ground wheat 30, wheat bran 15, alfalfa hay meal 3, dried yeast 3, cod fishmeal 8, soya grits 8, CaCO_3 1.2, Ca phosphate 1.2, salt 0.6, Dohyfral extra A + D₃ 0.02 per cent.; (2) methionine-low, the same except for the cereals, which were maize 20, wheat 15, barley 40 per cent.; (3) the same with 0.15 per cent. of DL-methionine; (4) methionine-low, maize 30, wheat 30, bran 13, cod fishmeal 4, soya grits 14, other items as in (1), with addition of 0.02 per cent. of a vitamin B₁₂ supplement containing 6 mg. vitamin B₁₂ per lb. and 0.22 per cent. of a penicillin supplement containing 2 g. penicillin G per lb.; (5) the same with 0.15 per cent. of DL-methionine. The chicks were weighed and feed eaten was measured weekly.

The results are tabulated and weight gains are shown graphically. The final mean weights in g. were 620, 583, 584, 645, 716, respectively. It was concluded that the reduction of the fishmeal could be compensated for by supplements of vitamin B₁₂ combined with methionine; the part played by penicillin is still open to question. The fact that methionine did not improve the barley ration indicates that poor growth on that ration was not due to the low methionine content of barley but to some substance present in barley.—W. M. Deans.

2563

PATRICK, H. **The effect of processing method and certain supplements on a lysine deficiency in cottonseed meal for chicks.** *Poultry Sci.*,

N.A. and R., April 1954

1953, **32**, 942-944. [Dept. Poultry, Univ. Tennessee, Knoxville.]

In a series of 3 growth trials, chicks were fed from day-old to 5 weeks of age on a basal ration made up of cottonseed meal 30, ground oats 10, ground wheat 25, minerals 4.5, vitamin A and D concentrate, riboflavin, vitamin B₁₂ and maize-meal to 100.

The mean finishing weight of chicks receiving this ration made up with a "commercially prepared solvent-processed" cottonseed meal low in gossypol was 360 g., compared with the finishing weight of 437 g. of chicks receiving a similar ration containing a solvent-processed soya bean meal in place of the cottonseed meal. Chicks receiving the cottonseed meal ration supplemented with 0.5 per cent. lysine weighed 396 g. The substitution of a meal prepared in the laboratory by extraction of cottonseed with ether gave results similar, and the use of a hydraulic-processed meal gave results inferior to those obtained with the "commercial solvent" meal, both with and without the addition of lysine.

In a further trial final weights of 187 and 310 g. were obtained with the "hydraulic" and the "commercial solvent" meal, respectively. When 5 parts of cottonseed were replaced by other protein supplements the final weights were: with casein, 405 and 412 g., respectively; with soya bean oilmeal 334 and 424 g.; and with sesame seed meal 234 and 362 g.—K. J. Carpenter.

2564

ATKINSON, R. L., REID, B. L., QUISENBERRY, J. H. and COUCH, J. R. **Antibiotics, methionine and unidentified growth factors in the nutrition of Broadbreasted Bronze turkey poults.** *J. Nutrition*, 1953, **51**, 53-64. [Dept. Poultry Husb., Texas Agric. Exp. Stat., College Station.]

A control group of 33 day-old poults, from a commercial breeding flock, were fed to appetite on a ration of soya bean meal 60, yellow maize-meal 35, minerals 5 and vitamins A, B₁₂, D₃, riboflavin, calcium pantothenate, nicotinic acid and choline chloride. At 8 weeks of age they had a mean weight of 1051 g. Parallel groups receiving the same ration supplemented with 11 p.p.m. bacitracin or 0.05 per cent. methionine were, respectively, 5 and 21 per cent. heavier. A further group receiving both supplements were on the average 35 per cent. heavier than the controls.

In a second, similar trial, a group receiving 11 p.p.m. aureomycin in their ration were, at 10 weeks of age, 2 per cent. heavier than the control group. Two more groups receiving a dietary supplement of 5 per cent. distiller's dried solubles (DDS) and a mixed supplement of aureomycin

and DDS, respectively, were 18 and 14 per cent. heavier than the controls.

On a modified control ration with 55 per cent. soya bean meal and ground milo in place of yellow maize-meal, 48 poults had a mean weight of 1222 g. at 8 weeks of age. Groups receiving 4.4 p.p.m. penicillin or 11 p.p.m. bacitracin were 20 and 13 per cent. heavier. Groups receiving 5 per cent. of DDS, alone or in combination with either penicillin or bacitracin, were 0, 23 and 16 per cent. heavier than the control group. In a further trial with similar conditions the addition of bacitracin again stimulated growth above that on the control ration, but had little effect when added to a ration already supplemented with DDS.

In a last trial with poults from a breeding flock fed on an experimental ration specially supplemented with sources of unidentified growth factors, the mean liveweight at 8 weeks of age of a group receiving the modified control ration was 1391 g. Groups receiving the same ration supplemented with 0.05 per cent. methionine or 5 per cent. DDS weighed 1533 and 1743 g., respectively. The addition of bacitracin or penicillin to these rations did not give consistently faster growth.

K. J. Carpenter.

2565

FULLER, H. L. **Relationships among fish products, methionine and antibiotics.** *Poultry Sci.*, 1953, **32**, 900. *Proc.* [Univ. Georgia, Athens.]

2566

ANDERSON, J. O. and DRAPER, C. I. **Effect of histamine on the growth rate of chicks.** *Poultry Sci.*, 1953, **32**, 886. *Proc.* [Utah State Agric. Coll., Logan.]

2567

LILLIE, R. J., SIZEMORE, J. R. and BIRD, H. R. **Unidentified factors in poultry nutrition. 1. Development of chick assay.**

MENGE, H., DENTON, C. A., SIZEMORE, J. R., LILLIE, R. J. and BIRD, H. R. **2. Properties and preliminary fractionation of a growth factor in condensed fish solubles.** *Poultry Sci.*, 1953, **32**, 855-862; 863-867. [Bur. Animal Indust., U.S. Dept. Agric., Beltsville, Md.]

1. In the first and second experiments, it was found that New Hampshire male chicks were more sensitive than New Hampshire females, both sexes of Rhode Island Reds, or Beltsville Small White turkey poults to the presence or absence of unidentified growth factors in fishmeal. It was further shown that the basal ration of maize 61, soya bean 27, alfalfa meal 5 and fishmeal 4 was adequate in all known nutrients for growth.

With the technique evolved above, it was shown that fish solubles, fishmeal, wood yeast or dried

brewer's grains all contained a growth substance shown only to a small extent by dried whey. A combination of condensed fish solubles, wood yeast and dried whey produced a response similar to that of the fish solubles alone, indicating that each contained the same factor. Further experiments showed that meat-and-bone scraps, dried cells of *Torula utilis*, *Hansenula suaveolens* or *Bacillus subtilis*, dried sewage sludge, hatchery residues and dried poultry offal all increased the growth of chicks. In addition to dried whey, orotic acid and Bispar 'C' liver fraction had no such property, and dried *Streptomyces olivaceus* had only a slight effect.

2. The assay method used was that described in the previous section. It was shown that the growth factor in condensed fish solubles was stable when autoclaved for 30 min. at 15 lb. pressure at pH 2 to 11, but broke down at pH 1. When the condensed fish solubles were centrifuged at 1500 r.p.m. for 30 min., 3 layers separated, the top one being inert. The growth factor present in the remaining two-thirds was dialysable. It was found to be soluble in 50, 60 and 80 per cent. ethanol and 70 per cent. methanol but insoluble in ether. Using a two-phase water-phenol system it was possible to isolate substances active at concentrations of 0.04 to 0.055 per cent. of the ration, representing a concentration of 30 times compared with condensed fish solubles.

The addition of L-lyxoflavin or a mixture of amino-acids present in condensed fish solubles failed to give a growth response.—M. J. Head.

2568

ARSCOTT, G. H., SWEET, G. B., JONES, H. L. and COMBS, G. F. **Experimental variables which influence the response of chicks to unidentified growth factors.** *Poultry Sci.*, 1953, **32**, 886–887. *Proc.* [Univ. Maryland, College Park.]

2569

JOHNSON, E. L. **Season and carbohydrate source affect chick response to unidentified factors.** *Poultry Sci.*, 1953, **32**, 930–931. *Proc.* [Iowa State Coll., Ames.]

2570

WIESE, A. C., PAPPENHAGEN, A. R. and PETERSEN, C. F. **Fractionation studies on the unknown chick growth factor present in fish solubles.** *Poultry Sci.*, 1953, **32**, 928. *Proc.* [Univ. Idaho, Moscow.]

2571

PETERSEN, C. F., WIESE, A. C. and PAPPENHAGEN, A. R. **Chick growth response to an unidentified factor in fish solubles, dried whey and**

other supplements. *Poultry Sci.*, 1953, **32**, 921. *Proc.* [Univ. Idaho, Moscow.]

2572

BERG, L. R. and BLAYLOCK, L. G. **Studies with unidentified factor(s) present in fish solubles required for chick growth.** *Poultry Sci.*, 1953, **32**, 889. *Proc.* [State Coll. Washington, Pullman.]

2573

CARVER, D. S. and JOHNSON, E. L. **Unsaturated fats as sources of unidentified chick growth factors.** *Poultry Sci.*, 1953, **32**, 892. *Proc.* [Iowa State Coll., Ames.]

2574

PATRICK, H. **Studies on an unidentified growth promoting and pigmentation factor required by chicks.** *Poultry Sci.*, 1953, **32**, 920. *Proc.* [Univ. Tennessee, Knoxville.]

2575

HILL, C. H. and KELLY, J. W. **The effect of antibiotics on the growth of chicks raised in new quarters.** *J. Nutrition*, 1953, **51**, 463–466. [Dept. Poultry Sci., Univ. N. Carolina, Raleigh.]

In a series of trials New Hampshire chicks from a commercial hatchery were grouped in wire-floored pens in a battery house not previously used for poultry, and were fed from day-old to 4 weeks of age on a control ration made up of soya bean meal 30, fishmeal 3, dried whey 3, alfalfa meal 3, methionine 0.2, vitamins, minerals and yellow maize meal to 100.

In the first trial the group fed on the control ration had a mean weight of 375 g. at 4 weeks, and that of a parallel group receiving the same ration supplemented with 22 p.p.m. crystalline aureomycin hydrochloride was not significantly different.

In the second trial the same cages were used, and only the dropping pens had been washed out. Again, a group receiving 22 p.p.m. aureomycin in their ration was no heavier than a control group; but a third group receiving 220 p.p.m. aureomycin was 10 per cent. heavier.

The same was found in a third trial with these 3 treatments in old, steam-sterilised cages in a new building.

It is concluded that a growth response may be obtained with chicks, even in new buildings and with new equipment, if large amounts of an antibiotic are given, and even though no response is obtained with amounts that give a response under farm conditions. It is suggested that organisms responsible for decreasing the growth rate of chicks

reared in new quarters may be more resistant to antibiotics than corresponding growth-retarding organisms met by chicks placed in quarters previously used.—K. J. Carpenter.

2576

WILSON, J. E. **The effects of penicillin supplements to the diet of turkey poults and chicks.** *Vet. Rec.*, 1953, **65**, 633-639. [Minist. Agric. Fish., Eskgrove, Lasswade.]

Turkey poults were reared from hatching to 4 weeks of age in wire-floored brooders and fed to appetite on a commercial dry "starter" mash. They were then transferred to solid floors and fed on "grower's mash", with a free choice of grain in addition after they were 12 weeks of age. In a series of 3 trials with 140 birds 47 per cent. died during the rearing period, and the survivors finished at 23 weeks of age with a mean liveweight of 6660 g. Parallel groups receiving the same treatment with the addition to their mash of 12 g. procaine penicillin per ton suffered only 14 per cent. loss and the survivors had a mean finishing weight 12 per cent. greater than that of the un-supplemented controls. The males receiving penicillin were 14 per cent. and the females 10 per cent. heavier than the corresponding controls.

The greatest effect of penicillin was observed in the first 4 weeks, when most of the deaths occurred, and at 4 weeks of age the supplemented birds were 51 per cent. heavier than the surviving controls. In further studies poults which had received penicillin only till they were 12 weeks of age gave a result not significantly different from parallel groups of birds that received the supplement from hatching to 23 weeks of age.

These trials were made in equipment that had been in use for several years. In short-term trials with new and isolated equipment poults with or without penicillin grew and survived as well as those raised in the old equipment and receiving supplementary penicillin.—K. J. Carpenter.

2577

FELL, R. V. and STEPHENSON, E. L. **The effect of penicillin and penicillamine on chick growth when injected and when fed orally.** *Poultry Sci.*, 1953, **32**, 1092-1093. [Dept. Animal Indust., Univ. Arkansas, Fayetteville.]

Groups of 20-week-old White Wyandottes were given a basal ration containing 63 per cent. maize, 28 per cent. soya bean oilmeal, 4 per cent. fishmeal and 2 per cent. alfalfa meal, with adequate mineral and vitamin supplements. The following daily treatments were given: (1) nil; (2) 0.1 ml. saline injection; (3) 0.05 mg. penicillamine injection; (4) 0.1 mg. penicillamine injection; (5) 0.05 mg. penicillin injection; (6) 0.1 mg. penicillin injection; (7) 1 mg. penicillamine per lb. feed, by mouth;

(8) 1 mg. penicillin per lb. feed, by mouth, both substances dissolved in saline at a concentration of 1 mg. per ml. for injection and oral administration. The average gains to 3 weeks of age in duplicate experiments were: (1) 250 and 257, (2) 237 and 272, (3) 250 and 301, (4) 263 and 302, (5) 265 and 280, (6) nil and 287, (7) 248 and 294, (8) 254 and 274 g.—M. J. Head.

2578

STOKSTAD, E. L. R., JUKES, T. H. and WILLIAMS, W. L. **The growth-promoting effect of aureomycin on various types of diet.** *Poultry Sci.*, 1953, **32**, 1054-1058. [Lederle Labs. Div., American Cyanamid Co., Pearl River, N.Y.]

All the Barred Rock × New Hampshire chicks used were obtained from eggs laid by hens given a ration low in vitamin B₁₂. Duplicate groups of 10 to 12 day-old chicks were given a synthetic ration containing 20 per cent. casein, 8 per cent. gelatine and 60.5 per cent. carbohydrate as starch, sucrose, cerelese or lactose, with adequate mineral and vitamin supplements, including 5 µg. vitamin B₁₂ per 100 g. feed. Supplements of 100 mg. aureomycin and 100 g. liver residue (72 per cent. protein after hot-water extraction) per kg. feed were given singly or together.

The growth response to aureomycin was greatest on the sucrose ration and least on the starch ration. The growth response to the liver residue was greater with the starch and cerelese rations than with those containing sucrose. The growth with all rations containing lactose was poor. There was no effect on growth from the interaction of aureomycin and liver residue. With the antibiotic the time taken for feed to pass through the intestine increased from 126 to 184 min. on the sucrose diet, but the passage times of 180 min. for cerelese and starch were not affected.

In a further series of trials, 100 mg. aureomycin and 100 g. yeast per kg., separately or together, were given as supplements to a 30 per cent. and a 70 per cent. soya bean oilmeal ration and to a ration containing 25 per cent. of a sodium salt of purified soya bean protein. Both supplements improved growth; their effects were independent and additive. Yeast had no beneficial effect in the 70 per cent. soya bean ration.—M. J. Head.

2579

NORDSKOG, A. W. and JOHNSON, E. L. **Breed differences in response to feeding antibiotics.** *Poultry Sci.*, 1953, **32**, 1046-1051. [Iowa State Coll., Ames.]

A basal ration of mixed cereals, fishmeal and meat-and-bone scrap was used, supplemented with 1 mg. procaine penicillin or 4.5 mg. aureomycin per lb. feed. Birds from 3 hatches were used,

containing members of 9 breed types: (a) inbred: Leghorn and Heavy; (b) outbred: Leghorn, Rhode Island Red, Barred Plymouth Rock and Egyptian; (c) strain crosses: Leghorn; (d) top crosses: Leghorn; (e) crossbred: Heavy. During an 8-week experimental period, the antibiotics produced similar increases in growth, on the average 12.7 per cent. for all breeds; inbred Heavy and Egyptian outbred gave only a 6.3 and a 7.0 per cent. increase, but Barred Plymouth Rock outbred gave a 22.6 per cent. increase. These differences in breed liveweight response to antibiotic supplements were highly significant. Mortality was 3.7 per cent. with antibiotics and 9.1 per cent. on the control rations, a statistically significant difference, but there was no significant difference between breeds.—M. J. Head.

2580

MCGINNIS, J. and STERN, J. R. **Effect of the feed pelleting process on growth response of poults to antibiotic supplements.** *Poultry Sci.*, 1953, **32**, 1036-1038. [Dept. Poultry Sci., State Coll. Washington, Pullman.]

Groups of 10 day-old unsexed Broad Breasted Bronze poults were given a basal ration containing 42.7 per cent. ground maize, 10 per cent. herring meal, 37.8 per cent. soya bean meal, 2.5 per cent. dehydrated alfalfa, minerals and vitamins, with supplements of 1, 2 and 5 p.p.m. diamine penicillin, 1, 2 and 5 p.p.m. procaine penicillin and 2, 5 and 10 p.p.m. aureomycin, the antibiotics being added either before or after pelleting. In trial 1, pharmaceutical grade antibiotics were used, and in trial 2, commercial antibiotic feed supplements.

The results indicated that either form of penicillin produced a similar growth response at any dose level whether added before or after pelleting and irrespective of grade. Best results with aureomycin were obtained when it was added before pelleting, particularly at the 2 p.p.m. level. There was no difference in the response to the different qualities of aureomycin.—M. J. Head.

2581

DYMSZA, H., BOUCHER, R. V. and CALLENBACH, E. W. **The influence of antibiotic supplementation on certain physical and chemical characteristics of turkey poults.** *Poultry Sci.*, 1953, **32**, 989-993. [Dept. Agric. Chem., Pennsylvania State Coll., State College, Pa.]

Two groups of 90 day-old White Holland poults were given a basal ration of practical type with or without 10 g. terramycin per ton for a 4-week period. All chicks were killed, sexed and stored at 34° F. overnight before the physical measurements were made. The birds were then frozen at - 20° F. and ground for analysis.

The antibiotic increased liveweight by 11 per cent. and empty weight by 14.5 per cent., both differences being statistically significant. The weights of the empty intestinal tract less caeca, empty gizzard, empty caeca and contents of the alimentary canal from poults given antibiotic were 10.5, 10.9, 2.4 and 7.8 per cent. higher, respectively, than those of controls. It is thought that these data represent normal increases in growth because when expressed as percentage empty weight they are similar to those from the control birds. The carcasses of the birds given antibiotic had a higher percentage of dry matter; otherwise the composition was similar.—M. J. Head.

2582

JONES, H. L. and COMBS, G. F. **Effect of aureomycin HCl on the utilization of inorganic nitrogen by the chick.** *Poultry Sci.*, 1953, **32**, 873-875. [Dept. Poultry Husb., Univ. Maryland, College Park.]

Urea, ammonium citrate and dibasic ammonium phosphate, used as single supplements, failed to increase the value of low-protein chick rations, as judged by either growth rate or feed conversion efficiency of chicks in the first 4 weeks of life. This was true for rations with and without either 10 or 25 p.p.m. aureomycin hydrochloride.

K. J. Carpenter.

2583

HILL, C. H., BORCHERS, R. L., ACKERSON, C. W. and MUSSEHL, F. E. **Studies on chick growth stimulation by alfalfa juice, casein, and aureomycin.** *Poultry Sci.*, 1953, **32**, 775-779. [Dept. Agric. Chem., Univ. Nebraska, Lincoln.]

In a series of trials, groups of newly hatched chicks from breeding flocks fed on normal commercial rations were given a high-protein ration of soya bean meal 70, maize meal 23, methionine 1.1, minerals and vitamins. Two groups of chicks on this ration alone had a mean weight of 528 g. at 6 weeks; parallel groups on the same ration supplemented with 5 per cent. of a juice expressed from freshly cut alfalfa were 9 per cent. heavier. In a further trial a group on the control ration supplemented with 10 mg. aureomycin hydrochloride per lb. weighed 347 g. at 5 weeks, and a second group receiving the ration supplemented with both alfalfa juice and aureomycin was no heavier. Casein as a supplement to the ration appeared to stimulate growth in both presence and absence of aureomycin.

With a second control ration, similar to the first but with glucose in place of maize meal, the growth of groups receiving either supplementary aureomycin or alfalfa juice was similar to that of the group receiving this ration without supplement.

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Faster growth was obtained with a group receiving both supplements.—K. J. Carpenter.

2584

SAXENA, H. C., BLAYLOCK, L. G., CARVER, J. S. and MCGINNIS, J. **Factors affecting the growth response of turkey poults to antibiotics.** *Poultry Sci.*, 1953, **32**, 788-791. [Dept. Poultry Sci., State Coll. Washington, Pullman.]

Newly hatched poults from dams fed on practical rations were housed in cages with raised wire floors. Three groups, each of 10 poults, were fed to appetite on a dry mash consisting of solvent-extracted soya bean meal 52.4, dried brewer's yeast 2, alfalfa meal 2.5, choline chloride 0.1, riboflavin, vitamins A and D supplement, minerals and yellow maize meal to 100. This ration was calculated to contain crude protein 28, Ca 2.1 and P 1.0 per cent. The poults had a mean liveweight of 480 g. at 4 weeks of age.

Further birds which received the same ration supplemented with 5 per cent. of herring meal, added at the expense of soya bean, maize and minerals so as not to alter the total contents of crude protein, Ca and P had a mean weight of 523 g. Groups receiving 2.5, 7.5 and 10 per cent. of herring meal in their mash weighed 470, 506 and 499 g. per head, respectively.

Poults receiving the control ration supplemented with 3 p.p.m. of diamine penicillin weighed 544 g., and those receiving both penicillin and 5 per cent. of herring meal weighed 655 g.—K. J. Carpenter.

2585

ALMQUIST, H. J. and MERRITT, J. B. **The value of antibiotic supplements for growth and feed conversion in diets for growing turkeys.** *Poultry Sci.*, 1953, **32**, 878-880. [Grange Co., Modesto, Calif.]

Turkey poults were divided at hatching into 5 groups each of 400 birds. A control group was fed on commercial mashes, all containing 5 g. aureomycin per ton, which declined in protein content from 28 per cent. for the first month to 20 per cent. after the birds reached 10 weeks. In 16 weeks the toms had a mean weight gain of 8.0 lb. and the hens of 6.0 lb.

In a similar group that received the same treatment with an additional supplement of 2 g. diamine penicillin per ton mash, the toms and hens finished with mean weights of 9.2 and 6.2 lb., respectively. Further groups received diamine penicillin for different portions of the growing period, and it was concluded that the toms showed a response in growth rate to this supplement at any period, but that they reverted to the normal growth rate when the supplement was removed.

K. J. Carpenter.

2586

WILSON, A. A. and EASTWOOD, B. **Experiences with the feeding of procaine penicillin to poultry.** *Vet. Rec.*, 1953, **65**, 665-668. [Res. Dept., Boots Pure Drug Co., Ltd., Thurgarton, Notts.]

A control group of 30 chicks was housed intensively and fed from day-old to 8 weeks of age on a commercial starting mash, and then on a commercial growing mash. Three parallel groups received the same treatment with the addition of 2, 4 or 10 g. procaine penicillin per ton feed. At 16 weeks of age the mean weight of the control birds was 4 lb. 7 oz., and that of those receiving penicillin was 7 oz. greater. There was no significant difference between the mean weights with the different levels of penicillin.

In a field trial with similar rations a control group of 170 cockerels had a mean weight of 3 lb. 10 oz. at 15 weeks of age, and 2 similar groups that had received 2.5 g. procaine penicillin per ton mash had a mean weight 4 oz. greater. In both these trials there was a tendency for feed conversion to be more efficient, by 3 to 6 per cent., in the birds receiving penicillin than in the controls.

A group of 27 poults was reared from hatching to 16 weeks of age on commercial rations and finished with a mean weight of 8 lb. 6 oz. Two further groups received the same treatment with supplements of 15 g. procaine penicillin per ton mash. All groups also received grain in amounts increasing to 50 per cent. of their total feed by the end of the growing period.

The turkeys receiving penicillin had a mean weight of 1 lb. 14 oz. above that of the control group. There was a tendency for the difference to be greater with the females than with the males. The control group and one group receiving penicillin were weighed again at 24 weeks of age; the latter were heavier by 2 lb. 3 oz.

K. J. Carpenter.

2587

KRÜGER, L., SEEFELDT, G. and LÖTHE, E. **Kükenaufzuchtversuche mit "Entan" und "Fortracin".** [Chick rearing experiments with "Entan" and "Fortracin".] *Arch. Geflügelk.*, 1953, **17**, 274-284. [Inst. Tierzucht, Justus Liebig Hochsch., Giessen.] English summary.

In the first experiment, 3 groups of 37 Leghorn cockerels were fed in batteries from 8 days to 9 weeks. For the first 5 weeks group 1 had a normal ration of coarsely ground barley, maize and milo each 20, fishmeal 22, dried skimmed milk 6, dried yeast 3, alfalfa meal 3, calcium carbonate 4 and wood charcoal 2 per cent., group 3 the same with 0.5 per cent. Entan, a preparation of vitamin B₁₂ and terramycin, replacing the same amount of milo, and group 2 the same as group 3 except that half the fishmeal and half the dried milk were

replaced weight for weight by soya grits. For the last 3 weeks group 1 had ground barley 5, maize 10, milo 20, wheat 25, groundnut meal 5, malt sprouts 5, meatmeal 8, herringmeal 5, dried skimmed milk 3, alfalfa meal 5 and other items as before, group 3 the same with 0.5 per cent. Entan replacing maize, and group 2 the same as group 3 with half the animal protein replaced by groundnut meal 4, malt sprouts 3 and dried yeast 1 per cent. The chicks were weighed and feed eaten was recorded weekly and the results are presented in tables and graphically.

Group 2 gained as well as group 1 and showed less of a check in growth when the ration was changed; feed utilisation was slightly better and feed cost less. On the other hand, no advantage resulted from addition of Entan to a ration containing a normal amount of animal protein.

In the second experiment 2 groups each of 40 cockerels were fed from 14 days to 10 weeks on a ration of ground barley 22, maize 13, milo 20, soya grits 20, dried yeast 3, dried skimmed milk 3, fishmeal 11, alfalfa meal 3, wood charcoal 2, calcium carbonate 1.95 and calcium phosphate 1.05 per cent., or the same with 0.3 per cent. Fortracin, a preparation of bacitracin, replacing ground maize.

The group with Fortracin made poorer gains, although towards the end they tended to catch up, and feed intake was slightly greater. Whether Fortracin would be of benefit when added to a ration with half the animal protein, or in conjunction with vitamin B₁₂, remains to be seen.

W. M. Deans.

2588

WHITE-STEVENS, R. and ZEIBEL, H. G. **The effect of aureomycin on the growth efficiency of broilers in the presence of chronic respiratory disease.** *Poultry Sci.*, 1953, **32**, 928. *Proc.* [Lederle Labs. Div., American Cyanamid Co., Pearl River, N.Y.]

2589

DYMSZA, H., BOUCHER, R. V. and CALLENBACH, E. W. **Physical and chemical characteristics of turkey poults fed a diet with and without antibiotic supplementation.** *Poultry Sci.*, 1953, **32**, 897-898. *Proc.* [Pennsylvania State Coll., State College.]

2590

YACOWITZ, H. **Supplementation of corn-soybean oil meal rations with penicillin and various fats.** *Poultry Sci.*, 1953, **32**, 930. *Proc.* [Ohio Agric. Exp. Stat., Wooster.]

2591

DE MAN, T. J. **Antibiotica in de pluimveehouderij. [Antibiotics in poultry keeping.]** *Tijdschr. Diergeneesk.*, 1953, **78**, 969-975 (with discus-

sion 975-981). *Proc.* [Amersfoort.] English, French and German summaries.

2592

WHARTON, F. D. (Jr.) and FRITZ, J. C. **Studies on the effect of an arsenical in the diet of the immature and mature chicken.** *Poultry Sci.*, 1953, **32**, 1014-1020. [Dawe's Labs., Inc.]

Two groups of 126 day-old New Hampshire chicks were given to appetite a basal starter ration containing 48.8 per cent. maize, 10 per cent. middlings, 5 per cent. ground oats, 22.5 per cent. soya bean meal, 2.5 per cent. meat-and-bone meal, 1.25 per cent. fishmeal and 5 per cent. dehydrated alfalfa meal, with mineral and vitamin supplements. At 40 days of age the rations were changed to grower rations and at 23 weeks of age to layer rations containing antibiotic. A supplement of 2.27 g. *p*-hydroxyphenylarsonic acid per 100 lb. feed was given to one group; thereafter half the birds from each group reversed their "starting-growing" treatment.

The arsenical had no effect on growth at the level used, but the supplemented birds produced slightly heavier eggs and utilised their feed more efficiently. No effect was observed on fertility, hatchability, weight of chicks at hatching or growth of progeny. Eggs from the birds given arsenic during the laying period contained 0.21 p.p.m. As₂O₃ as against a control figure of 0.06 p.p.m.

M. J. Head.

2593

FROST, D. V. and SPRUTH, H. C. **Further studies on arsanilic acid and related compounds in nutrition.** *Poultry Sci.*, 1953, **32**, 900. *Proc.* [Abbott Labs., N. Chicago, Ill.]

2594

MILLIGAN, J. L., MARR, J. E., WILCKE, H. L., BETHKE, R. M. and MCKINNEY, A. W. **Arsenic acid in commercial broiler rations.** *Poultry Sci.*, 1953, **32**, 916. *Proc.* [Ralston Purina Co., St. Louis, Mo.]

2595

HARTUNG, T. E. **A study of chick growth response to liquid betaine concentrate supplementation.** *Poultry Sci.*, 1953, **32**, 905. *Proc.* [Colorado Agric. and Mech. Coll., Fort Collins.]

2596

BRANTON, H. D. and HILL, D. C. **Detergents and chick growth.** *Poultry Sci.*, 1953, **32**, 890. *Proc.* [Ontario Agric. Coll., Guelph.]

2597

ANDERSON, C. L. **Effects of testosterone on pullets.** *Poultry Sci.*, 1953, **32**, 883-884. [Agric. Exp. Stat., Oregon State Coll., Corvallis.]

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Groups of 15 day-old Delaware \times New Hampshire pullets and a similar number of straight New Hampshire pullets were given rations containing 5, 15 and 45 mg. methyl testosterone per lb. feed; a further group of each breed was given 5 mg. methyl testosterone per lb. feed from the sixth to the tenth week only. A group of 15 cockerels was also carried through the experiment. Methyl testosterone had no effect on liveweight or feed conversion, but the pullet chicks developed bright red combs and wattles.—M. J. Head.

2598

PEPPER, W. F., SLINGER, S. J. and SNYDER, E. S. **Value of low levels of soybean oil in broiler diets containing a high percentage of wheat.** *Poultry Sci.*, 1953, **32**, 1084-1086. [Dept. Poultry Husb., Ontario Agric. Coll., Guelph.]

A group of 125 day-old male chicks and a similar group of females were fed to appetite on a ration made up of soya bean oilmeal (solvent-extracted) 24, fishmeal 2.5, dried buttermilk 2, meatmeal 1, grassmeal 2, minerals 2.25, fish oil 0.25, riboflavin, 3-nitro-4-hydroxy-phenylarsonic acid, sulphaquinoxaline, a vitamin B₁₂ and penicillin supplement, DL-methionine, yellow maize meal and ground wheat to 100. After 6 weeks the chicks received a modified mash containing only 15 parts of soya bean oilmeal and additional maize meal. At 11 weeks the birds were killed. Their mean final weight was 1937 g. for the males and 1508 g. for the females, with feed conversions of 2.85 and 3.08 g. feed per g. gain, respectively.

Further groups receiving the same rations supplemented with 2 per cent. of soya bean oil at the expense of maize meal finished with mean weights of 1957 and 1553 g. and feed conversion quotients of 2.75 and 3.02, respectively. Parallel groups receiving 1 per cent. of oil also gave similar results. The mashes containing oil were less dusty and gave a better market finish than the control mashes.—K. J. Carpenter.

2599

GRIMINGER, P., FISHER, H., MORRISON, W. D., SNYDER, J. M. and SCOTT, H. M. **The influence of different levels of alfalfa meal added to a corn-soybean meal type of ration on blood clotting time.** *Poultry Sci.*, 1953, **32**, 902. *Proc.* [Illinois Agric. Exp. Stat., Urbana.]

2600

MACGREGOR, H. I., BLAKELY, R. M. and JOWSEY, J. R. **The effect on turkey growth and carcass quality of growing mash, concentrate, and pelleted concentrate fed free choice with whole grains.** *Poultry Sci.*, 1953, **32**, 913.

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Proc. [Dominion Exp. Stat., Swift Current, Sask.]

2601

BLAKELY, R. M. and MACGREGOR, H. I. **The effect on growth of turkey poults of three cereal grains used singly and in combination.** *Poultry Sci.*, 1953, **32**, 930. *Proc.* [Dominion Exp. Stat., Swift Current, Sask.]

2602

LEME DA ROCHA, G. and FRANCISCO RAIMO, H. F. **Contribuição ao estudo dos substitutos dos farelos de trigo na alimentação das aves. 2. Guandu. [Substitutes for wheat products in poultry feeding. 2. Pigeon peas.]** *Bol. Indúst. animal, São Paulo*, 1952, **13**, 119-129. [Div. Zootec. Nutrição Animal.] English summary.

A ration containing 35 per cent. of wheat products (bran plus middlings) served as control and the test ration was identical except that the wheat products were entirely replaced by pigeon pea (*Cajanus cajan*) flour. Groups of 45 New Hampshire chicks were used and the experiment lasted from birth to 30 weeks of age.

At 14 weeks the test group had an average liveweight of 1263.5 g. and the controls of 1384.8 g. The 2 groups had consumed on the average 7001.0 g. and 7463.9 g. feed, respectively. No significant difference in body conformation or feathering was noted between the 2 groups. From 14 to 30 weeks of age the test group ate less feed than the controls and finished at the same average liveweight. Sexual maturity was delayed about 6 days in the test birds compared with controls. A 48-day egg laying test showed that the test birds laid 7.64 per cent. more eggs than the controls.

It was concluded that pigeon pea flour is suitable for poultry.—P. C. Jowsey.

2603

WILD, H. and COOPER, G. H. **Mexican clover (*Richardia brasiliensis*) as a green feed for poultry.** *Rhodesia Agric. J.*, 1953, **50**, 192-194.

The moisture content of Mexican clover was 73.0 per cent. and its composition on a dry matter basis was: ash 13.3, protein 21.3, oil 1.9, fibre 25.5, N-free extract 38.0 per cent. The ash contained Ca 4.9, MgO 0.7, P₂O₅ 0.8, K₂O 3.3, SiO₂ 3.4 per cent.

All classes of poultry ate the chopped plant with relish and preferred it to chopped alfalfa to which they were accustomed. No adverse effect was observed when the plant was given with the usual concentrates for several months.—P. C. Jowsey.

2604

LEWIS, J. C., IJICHI, K., SUGIHARA, T. F., THOMPSON, P. A., SNELL, N. S., ALDERTON, G. and

GARIBALDI, J. A. **Feed supplements. Genus *Bacillus* as a source of growth stimulants.** *J. Agric. Food Chem.*, 1953, **1**, 1159-1163. [W. Reg. Res. Lab., Albany 6, Calif.]

2605

GERRIETS, E. Vergleichende Kükenaufsuchtversuche nach veterinärhygienischen Gesichtspunkten und Aufsuchtversuche unter Verwendung der Altstreuverfahren. [**Comparative trials in chick rearing from the point of view of veterinary hygiene and experiments in rearing on deep litter.**] *Berl. Münch. tierärztl. Wochenschr.*, 1953, **66**, 385-392. [Abt. Geflügelkrank., Humboldt Univ., Berlin.] English summary.

After a review of the literature the results of an experiment made in a manner similar to those of Mehner (Abst. 1114, Vol. 23) are reported. Four groups of 400 chicks each were used and the experiment lasted 8 weeks. Groups 1 and 2 were kept on a layer of chopped straw 5 cm. deep which was replaced at first daily and then weekly. Group 2 had under-floor heating. Group 3 was kept on a layer 25 cm. deep built up of alternate layers of old hen litter and old garden mould. Group 4 was kept similarly but fresh horse manure replaced the hen manure. There was little difference in liveweight gain or feed utilisation over the 8-week period; if anything, those in group 1 were poorer than those in the other groups. The results were in general agreement with those of Mehner and did not show any great advantage of deep litter.

W. Godden.

2606

KENNARD, D. C., MOORE, E. N., and CHAMBERLIN, V. C. **The nutrition and sanitation properties of compost (built-up) litter.** *Poultry Sci.*, 1953, **32**, 931. *Proc.* [Ohio Agric. Exp. Stat., Wooster.]

2607

HATHAWAY, H. E., CHAMPAGNE, G. B., WATTS, A. B. and UPP, C. W. **Meat yield of broilers of different breeds, strains and crosses.** *Poultry Sci.*, 1953, **32**, 968-977. [Dept. Poultry Indust., Louisiana State Univ., Baton Rouge.]

In 3 trials with 1800 chickens of both sexes in all, grown to 12 weeks of age, the meat yields of broiler and non-broiler strains of Dark Cornish, New Hampshire, White Plymouth Rock and cross-breeds were compared. Total edible meat, breast meat, New York dressed weight and eviscerated carcass weight of 350 carcasses were estimated, and keel length, body depth and breast width were measured.

Males were 20 per cent. heavier than females when 12 weeks old, and broiler strains were heavier than non-broiler. Dark Cornish yielded a higher

percentage of edible meat, followed by White Plymouth Rock, crossbreeds and New Hampshire. The Dark Cornish were lightest in liveweight but greatest in breast width, and gave more total edible meat.

Breast width was found to be the best single measurement for estimating the percentage of breast meat and the total edible meat yield.

T. D. Bell.

2608

FRANCISCO RAIMO, H. O marreco Pequim como produtor de carne. [**The Pekin duck as meat producer.**] *Bol. Indúst. animal, São Paulo*, 1952, **13**, 111-117. [Div. Zootec. Nutrição Animal.] English summary.

From birth to 9 weeks of age 29 White Pekin ducklings ate on the average 8056 g. feed per head and reached an average liveweight of 2255 g. At this age sex did not significantly affect liveweight.

Ten ducks of each sex were killed at 9 weeks of age. Dressed and drawn but with head and feet, the carcasses weighed on the average 80.6 per cent. of the liveweight; without head and feet they weighed 65 per cent. Edible meat was 69.6 per cent. of dressed weight.

The edible meat had the following composition: water 70.0, protein 22.7, fat 4.1, ash 3.1 and matter not estimated 0.1 per cent.—P. C. Jowsey.

2609

COLES, R. **The production of table poultry.** *J. Sci. Food Agric.*, 1953, **4**, 532-539. [Minist. Agric. Fish., 1-4 Cambridge Terr., Regent's Park, London, N.W.1.]

Weight gains and feed consumption were recorded weekly for 15 groups of Light Sussex cockerels, 5 of North Holland Blues, 2 of New Hampshires and 1 of Marans. Each group consisted of 30 purebred birds housed in a concrete-floored building on deep litter and each bird had 3 sq. ft. of floor space. They were fed from day-old to 20 weeks on a dry mash of ground grains, groundnuts and fishmeal with grassmeal, bone flour, vitamin D₃ and manganistat salt. Nitrofurazone was added as a coccidiostat.

The results are given in detail for each breed. The average growth rate increased to the tenth week when the average weight was 3.28 lb., the average total feed consumption 10.06 lb. and the cumulative feed conversion ratio 3.06:1. After the tenth week average growth rate declined until the 16th week, then increased substantially and continued to do so until the end of the test at 20 weeks. Carcass condition and fleshing quality improved to a peak at the end of the tenth week; fleshing quality declined thereafter.

The results indicated that birds not specially bred for the table may be successfully reared for this purpose. An 11-week-old bird weighing about

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3½ lb. offers the best means of increasing the availability of poultry meat at a reasonable price to the consumer and with an adequate profit to the rearer. The cost of the feed given was taken to be 40s. per cwt. and on this basis a 3½ lb. bird at 11 weeks of age ate about 4s. 4d. worth of feed, equivalent to 1s. 2d. per lb. The feed cost per lb. of bird increased rapidly after the twelfth week. At 20 weeks the cost per lb. was on the average just over 2s. The large-sized roaster of about 6 lb. seems likely to remain within the luxury market.

P. C. Jowsey.

2610

DARROW, M. I. and STOTTS, C. E. **The influence of debeaking broilers upon growth rate, feed utilization, and market quality.** *Poultry Sci.*, 1953, **32**, 894. *Proc.* [Swift and Co., Chicago, Ill.]

2611

MORGAN, C. L. and WILLIMON, C. P. **Cottonseed meal prepared by different methods for broiler rations.** *Poultry Sci.*, 1953, **32**, 917. *Proc.* [S. Carolina Agric. Exp. Stat., Clemson.]

2612

PEPPER, W. F., SLINGER, S. J. and SNYDER, E. S. **Increasing the energy content of broiler diets high in wheat.** *Poultry Sci.*, 1953, **32**, 920-921. *Proc.* [Ontario Agric. Coll., Guelph.]

2613

LIBBY, D. A., SCHAIBLE, P. J., MEITES, J. and REINEKE, E. P. **Value of progesterone and estradiol on growth and finish in broilers.** *Poultry Sci.*, 1953, **32**, 1086-1088. [Dept. Poultry Husb., Michigan State Coll., East Lansing.]

2614

CARTER, R. D., RISNER, R. N. and YACOWITZ, H. **Some effects of growth hormone injections in poultry.** *Poultry Sci.*, 1953, **32**, 892. *Proc.* [Ohio State Univ., Columbus.]

See also Absts. 1694, 1695, 1756, 1793, 1859.

EGG PRODUCTION

2615

GILLIS, M. B., NORRIS, L. C. and HEUSER, G. F. **Phosphorus metabolism and requirements of hens.** *Poultry Sci.*, 1953, **32**, 977-984. [Agric. Exp. Stat., Cornell Univ., Ithaca, N.Y.]

Groups of 15 to 16 White Leghorn hens in their first production year were fed to appetite. In experiment 1, a low-P, semi-synthetic basal ration was given alone or with supplements of defluorinated phosphate to provide inorganic P at levels of 0.70, 0.50 or 0.25 per cent. and supplements of Ca phytate to give phytin P levels of 0.05, 0.25, 0.50

and 0.75 per cent., giving a total P level of 0.75 per cent.; the Ca level was 2.0 per cent. for all groups. Group 1 receiving 0.70 inorganic P and 0.05 per cent. phytate P was discontinued after 4 of the 6 months of the experimental period. Mortality in group 4 was 60 per cent. and the survivors lost weight, showing that phytate P was less readily utilised than inorganic P; egg production, bone ash and blood P were also low in this group. Group 2 gave satisfactory performance in all respects; group 3 were satisfactory except for liveweight gain, eggshell quality and blood inorganic P.

In experiment 2, the total P level in both rations was 0.74 per cent., with phytin P at 0.53 and 0.29 per cent. Bran supplied the phytate P and was removed from the bran by enzyme action for the ration low in phytate P. The results indicated that there was no difference in the utilisation of naturally occurring or pure phytate.

In experiment 3, two basal rations were used, one high and one low in phytate P. Each was given alone or supplemented with 0.67 and 1.33 per cent. CaHPO_4 . The low-phytin ration contained 0.10 per cent. phytate P and the high 0.32 per cent. and the supplements were of 0.39, 0.54 and 0.69 per cent. inorganic P. Additional groups received 0.15 per cent. and 0.30 per cent. inorganic P with each ration.

The group receiving 0.49 per cent. total P including 0.10 per cent. phytate P gave satisfactory egg production and liveweight maintenance, but blood inorganic P remained subnormal. The ration containing 0.47 per cent. total P including 0.32 per cent. phytate P was considerably improved, by all criteria, by a supplement of 0.15 or 0.30 per cent. inorganic P.

It is suggested that in synthetic diets 0.65 per cent. total P as inorganic P gives satisfactory results but that the level should be raised to 0.77 per cent. when commercial rations are given, to allow for the relative unavailability of phytate P.—M. J. Head.

2616

O'ROURKE, W. F., BIRD, H. R., PHILLIPS, P. H. and CRAVENS, W. W. **The hatchability effect of low phosphorus rations.** *Poultry Sci.*, 1953, **32**, 919. *Proc.* [Univ. Wisconsin, Madison.]

2617

KINDER, Q. B. and DAY, T. W. **A comparison of 20 per cent. to 24 per cent. protein laying mash in conventional feeding systems.** *Poultry Sci.*, 1953, **32**, 908. *Proc.* [Univ. Missouri, Columbia.]

2618

SCHMIDT, F. **Wpływ kazeiny jodowanej jako dodatku do karmy kurcząt na ich przyszłą**

nieśność. [The influence of iodised casein as an addition to the diet of pullets on their future production of eggs.] *Rocz. Nauk rol.* [B], 1953, 66, No. 2, 23-47. [Inst. Produkcji Zwierzęcej, Uniwers. Jagielloński.] Russian and English summaries.

Iodinated casein, 0.013 to 0.023 g. daily, was given to Rhode Island Red pullets for 86 days, when they started laying. There was no effect on age at maturity. After 50 days on treatment the general condition of the birds improved and liveweight increased. More eggs were laid per month but egg weight was not affected. Observations over 10 months' laying suggest that iodinated casein can effectively increase egg production on an adequate diet, at least in the first year. (From summary.)—T. D. Bell.

2619

BARBORIAK, J., JUCKER, H. and CRASEMANN, E. Über die Wirkung einer Rohleizithinzulage bei Legehennen. [Effect of a supplement of crude lecithin for laying hens.] *Arch. Geflügelk.*, 1953, 17, 245-259. [Inst. Haustiernährung, Tech. Hochsch., Zürich.] English summary.

In experiments at 2 centres with groups of White Leghorn pullets the addition of 4 per cent. of crude lecithin to a normal laying mash had no effect on the health or bodyweight of the birds, on the percentage of white, yolk and shell in the eggs or on the percentage of lecithin in the yolk. There was a slight but not significant increase in egg production and feed utilisation.—W. Godden.

2620

COONEY, W. T. and PARKER, J. E. Wood sugar molasses in the ration of floor managed layers. *Poultry Sci.*, 1953, 32, 1039-1046. [Oregon State Coll., Corvallis.]

The wood molasses used contained 50 per cent. sugar, of which 85 per cent. was hexose (mainly glucose) and 15 per cent. pentose (mainly xylose). The mash in which 7.5 or 15 per cent. of the molasses was incorporated formed 60 per cent. of the daily feed. Groups of 50 Single Comb White Leghorn pullets were used during a 334-day experimental period (September to July).

The birds receiving 7.5 per cent. wood molasses in the mash (4.4 per cent. of the total ration) produced 7 per cent. more eggs than the controls; the higher level had no effect on egg production, and feed efficiency was less. The wood shaving litter in the pen of birds receiving 15 per cent. wood molasses became sticky and difficult to handle and in consequence the number of soiled eggs was higher. The inclusion of molasses in the feed had no effect on bird mortality, liveweight gain or hatchability of eggs.—M. J. Head.

2621

ELAM, J. F., JACOBS, R. L. and COUCH, J. R. The effect of prolonged feeding of antibiotics upon the performance of laying hens. *Poultry Sci.*, 1953, 32, 792-795. [Dept. Biochem., Agric. and Mech. Coll. System, College Station, Tex.]

Ten pullet chicks were fed from hatching to 15 months on a ration of soya bean meal 35, with minerals, fish oil, riboflavin and Ca pantothenate, and yellow maize meal to 100. Each bird received also a weekly injection of 1 µg. vitamin B₁₂. At 15 weeks the birds were transferred from pens with raised screen floors to individual battery cages. In the last 9 months of the trial they gave a mean egg production of 56 per cent.

Similar groups that received in addition per kg. mash 33 mg. of bacitracin, penicillin or inactivated penicillin gave 62, 62 and 59 per cent. production, respectively. Groups receiving the same supplements by injection at the rate of 1.2 mg. per bird weekly gave 58, 60 and 58 per cent. production. Pullets that received an injection of 15,000 units of penicillin-in-oil on alternate days gave 62 per cent. production. All the pullets were artificially inseminated. Eggs from the unsupplemented group showed a mean hatchability of 79 per cent.; hatchability in the other groups ranged from 85 to 90 per cent.

In a parallel trial the same basal ration was used but none of the birds received vitamin B₁₂; egg production of the 10 control pullets was 46 per cent. and that of groups receiving bacitracin, penicillin or inactivated penicillin by mouth was 53, 53 and 44 per cent., respectively. Groups receiving the antibiotics by injection gave 46, 53 and 44 per cent. egg production. Hatchability was 53 per cent. in the control group and ranged from 43 to 66 per cent. in the other groups.—K. J. Carpenter.

2622

CHIN, G. and BRANT, A. W. Egg quality and aureomycin. *Poultry Sci.*, 1953, 32, 875-876. [Bur. Animal Indust., U.S. Dept. Agric., Beltsville, Md.]

March-hatched Rhode Island Red pullets were transferred at 22 weeks of age from range to 6 houses of 40 birds each and were given a basal ration alone or with 5, 10, 20 or 40 p.p.m. aureomycin. Egg samples taken after 38 weeks and 55 weeks showed that incidence of blood or meat spots did not rise, nor did quality of white deteriorate.

M. J. Head.

2623

SHERWOOD, D. H. and MILBY, T. T. Antibiotics in the ration of laying and breeding hens. *Poultry Sci.*, 1953, 32, 932. *Proc.* [Larro Res. Farm, General Mills, Inc., Detroit, Mich.]

N.A. and R., April 1954

2624

EVANS, R. J., BANDEMER, S. L., LIBBY, D. A. and GROSCHKE, A. C. **The arsenic content of eggs and tissues from hens fed arsanilic acid.** *Poultry Sci.*, 1953, **32**, 898. *Proc.* [Michigan State Coll., East Lansing.]

2625

FRANCISCO RAIMO, H. Estudo da produção de ovos na raça Pequim e suas principais características biológicas. [Egg production by Pekin ducks, and their chief biological characteristics.] *Bol. Indúst. animal, São Paulo*, 1952, **13**, 103-109. [Div. Zootec. Nutrição Animal.] English summary.

Four Pekin ducks were studied. Sexual maturity was reached at 161 days of age when the average bodyweight was 2615 g. Average yearly egg production was 178 and average egg weight 78.4 g. Maximum bodyweight was reached after 9 months and was, on the average, 2855 g.

The average composition of the whole egg, yolk and white, respectively, was: water 67.4, 48.2, 86.5; protein 14.7, 17.9, 11.8; fat 16.2, 32.3, 0.07 and ash 1.1, 1.6, 0.62 per cent.—P. C. Jowsey.

2626

CARSON, J. R. and JUNNILA, W. A. **Ultraviolet irradiation of the turkey hen.** *Poultry Sci.*, 1953, **32**, 871-873. [Dept. Poultry, Univ. Connecticut, Storrs.]

Groups of 10 Broad Breasted Bronze turkey pullets from 270 to 304 days old were housed in a small-windowed house without outside run. Three lighting regimes were allotted at random to duplicate groups: (1) incandescent light with maximum intensity 6.4 foot-candles, (2) ultraviolet light with 95 per cent. of the lamp energy output in the range 280 to 320 m μ . and maximum light intensity 0.9 foot-candle, (3) incandescent and ultraviolet light (as above) giving a maximum light intensity of 7.9 foot-candles, all measured at bird level. Each group had a 14-hr. light day. Fifty per cent. production in group 2 houses was reached 6 days later than in group 1 and 3 houses. The monthly average egg production of the groups for February, March, April, May and June was 39, 197, 150, 110 and 114; 7, 180, 146, 154, 89; 35, 207, 180, 187 and 150, respectively.—M. J. Head.

2627

RAGAB, M. T. and ASSEM, M. A. **Effect of atmospheric temperature and daylight on egg weight and yield in Fayoumi and Baladi fowls.** *Poultry Sci.*, 1953, **32**, 1021-1027. [Dept. Animal Breeding, Fac. Agric., Fouad I Univ., Cairo.]

The records of 286 Baladi and 245 Fayoumi pullets were studied. Both breeds, indigenous to Egypt and of obscure origin, produce in a year

only 154 small eggs: the average egg weights were 36.6 and 41.0 g., respectively. Egg number and size both decreased as atmospheric temperature increased. Increasing length of daylight increased egg production, but the full effect was not realised, since simultaneously increasing temperature counteracted it. In the first laying year egg size increased gradually up to the eighth or ninth month and then remained constant. There was no positive correlation between egg weight and the number of eggs produced.—T. D. Bell.

2628

HAYS, F. A. **Mortality rate in the laying house and egg production of survivors.** *Poultry Sci.*, 1953, **32**, 1096-1097. [Univ. Massachusetts, Amherst.]

Observations on pedigree Rhode Island Reds bred for high fecundity were made for 10 years. The study indicated that viability and egg production were not correlated.—T. D. Bell.

2629

ATKINSON, R. L., QUISENBERRY, J. H. and COUCH, J. R. **A factor in liver necessary for hatchability of turkey eggs.** *Poultry Sci.*, 1953, **32**, 887. *Proc.* [Texas Agric. and Mech. Coll., College Station.]

2630

BRUNSON, C. C. and GODFREY, G. F. **The relationship of egg shape, egg weight, specific gravity and 21-day incubation weight-loss to hatchability of Broad-Breasted Bronze turkey eggs.** *Poultry Sci.*, 1953, **32**, 846-849. [Oklahoma Agric. Exp. Stat., Stillwater.]

2631

PATERSON, E. B. and BLAYLOCK, L. G. **Effect of various sources of unidentified factors on hens receiving purified diets and on chicks hatched from these hens.** *Poultry Sci.*, 1953, **32**, 931. *Proc.* [State Coll. Washington, Pullman.]

2632

MACILRAITH, J. J. **A report on the seasonal variation in weight of eggs from Broad Breasted Bronze turkeys.** *Poultry Sci.*, 1953, **32**, 912-913. *Proc.* [California Turkey Growers Assoc., Davis.]

2633

CHANEY, P. H. and KINDER, Q. B. **The effect of ration and production level on the interior quality of eggs.** *Poultry Sci.*, 1953, **32**, 892. *Proc.* [Univ. Missouri, Columbia.]

See also Absts. 1757, 2602, 2603.

OTHER BIRDS

2634

BALDINI, J. T., ROBERTS, R. E. and KIRKPATRICK, C. M. **Low protein rations for the bobwhite quail.** *Poultry Sci.*, 1953, **32**, 945-949. [Dept. Poultry Sci., Agric. Exp. Stat., Purdue Univ., Lafayette, Ind.]

Groups of 35 unsexed day-old quail chicks were used in all the following experiments. In trial 1, groups were given the following percentage supplements to a soya bean and maize ration: (1) 0.30 L-arginine; (2) 0.30 L-lysine; (3) 0.30 L-cysteine; (4) 0.40 DL-threonine; group (5) had no supplement; for a further group (6) the soya bean oilmeal was raised to 60 per cent. and the maize reduced to 34 per cent., giving a total protein content of 28 per cent. compared with 20 per cent. in the basal ration of groups 1 to 5. Groups 2 and 6 weighed on the average 94 and 91 g., respectively, at 6 weeks of age and the other groups 75 g. each.

In trial 2, 10 per cent. wheat bran, rich in

lysine, supplemented soya bean and maize rations containing 20, 24 and 28 per cent. protein. The bran supplement increased growth rate only at the 20 per cent. protein level.

In trial 3, the basal rations for groups 1 to 5 contained maize and soya bean oilmeal in the percentage combinations 40.5 and 25, 40.5 and 30, 50.5 and 20, 40.5 and 25, and 40.5 and 20, with 10 per cent. menhaden fishmeal and 10 per cent. bran. Supplements were given as follows: (1) 5 per cent. maize gluten meal, (4) 5 per cent. dried buttermilk, (5) 10 per cent. dried whey, giving total protein contents of 25, 25, 22, 25 and 22 per cent. Rations 1, 2 and 4 produced the greatest growth, but ration 5, containing only 22 per cent. protein but including 1.4 per cent. lysine, produced better growth than ration 3 with only 1.1 per cent. lysine and the same total protein content.—M. J. Head.

See also Abst. 1717.

FOOD ECONOMICS AND STATISTICS

2635

PHILLIPS, R. **The fat stock of Anglesey and Caernarvon.** *J. Agric. Sci.*, 1953, **43**, 432-449. [Univ. Coll. Wales, Aberystwyth.]

The trade in fat cattle, calves and sheep through the collecting centres of Anglesey and Caernarvonshire in 1950 was surveyed.

The better climate of Anglesey was closely reflected in the greater weight and better condition of the cattle. The data suggest that many advantages would follow from the zoning of areas for agricultural production. Welsh black cattle were more numerous in both counties, but Herefords were at all times heavier, and steers fattened better than heifers; both these findings are contrary to common opinion.

Sheep are complementary, the hills of Caernarvonshire supplying breeding ewes for the flying flocks of Anglesey. When crossed with rams of heavier breeds they produce fat lambs of almost their own weight in 6 months. Most of the fat stock sales of sheep are of fat ewes, 23, and fat lambs, 73 per cent.—T. D. Bell.

2636

KIENHOLZ, B. U., KENDALL, J. R. and WESTCOTT, E. R. **Ohio agricultural statistics 1951 and 1952.** *Ohio Agric. Exp. Stat. Res. Bull.* No. 735, November 1953, pp. 45.

This bulletin contains, in addition to other data, the current estimates of acreage, yield and production of crops, and of livestock numbers on 1 January by counties, and prices for a 5-year period, compiled mainly from information supplied by the

Federal-State Cooperative Crop and Livestock Reporting Service.—W. Godden.

2637

U.S. DEPARTMENT OF AGRICULTURE, BUREAU OF AGRICULTURAL ECONOMICS. **Livestock and poultry on farms and ranches on January 1, number, value, and classes—1945-50, by States. Revised estimates.** *Statist. Bull.* No. 106, February 1952, pp. 24. [Washington, D.C.]

2638

Technology in food marketing. A survey of developments and trends in the processing and distribution of farm-produced foods, 1930-1950. *U.S. Dept. Agric., Agric. Monograph* 14, October 1952, pp. 115. [Washington, D.C.]

2639

U.S. DEPARTMENT OF AGRICULTURE, BUREAU OF AGRICULTURAL ECONOMICS. **Feed statistics including wheat-rye-rice.** *Statist. Bull.* No. 111, April 1952 and No. 121, January 1953. [Washington, D.C.]

2640

Discussion on organic manures and fertilizers and the production and consumption of food for man and animals. *Proc. Roy. Soc. Med.*, 1953, **46**, 791-798.

Contributions by 4 authorities to the discussion in the Society's Section of Comparative Medicine are reported.

Sir William Ogg, of Rothamsted Experimental Station, said that neither in Britain nor in the U.S. would the annual production of organic manures supply requirements for fertilisers. There was no evidence that erosion was associated with the use of artificial manures or that resulting crops were more prone to disease. In some cases resistance to pests had been shown to be increased in crops fertilised with nitrogen, and survey data indicated that food production in Britain could be increased substantially by the greater use of fertilisers.

Dr. G. C. Ainsworth, of the University College of the South West of England, dealt with soil-plant interactions under natural conditions and under cultivation. Dr. D. P. Cuthbertson, of the Rowett Research Institute, while calling for thorough investigation of any evidence that might be advanced of ill effects arising from the use of artificial fertilisers, emphasised the present lack of such evidence and gave examples of the benefits accruing from their use.

Sir James Scott Watson, of the Ministry of Agriculture, presented the agriculturist's point of view and indicated how rapid had been the advance in knowledge of plant growth over the last century in comparison with the slow accumulation of farming experience over thousands of years. He stressed the need for both prevention of erosion and maintenance of soil structure.

D. Harvey.

2641

SMITH, H. L. **Report on costs of milk production. 1. Annual report for the year ended 30th September 1952; 63 herds. 2. A five-year review, 1945-46 to 1949-50; 48 identical herds.** *Edinburgh and East Scotland Coll. Agric. (Dept. Econ.) Bull.* No. 38, April 1953, pp. 47.

The herds were mostly Ayrshires with a few Friesians and the yearly size ranged from 6 to 149 cows, with an average of 49 farms ranging in size from a town dairy with 25 acres grassland to an upland farm of 912 acres which included 352 acres of rough grazing. Tuberculin-tested milk was produced by 59 of the herds. Average yield was 767 gal., range from 515 to 991 gal. Annual cost per cow was £85 12s. 11d. and per gal. 26-81d. Profits were £39 2s. per cow or 12-23d. per gal. Feed accounted for 57 per cent. of the total cost, labour 20, miscellaneous 16 and herd maintenance 7. Net costs were 8 per cent. higher than in 1950-1951, though a 4 per cent. increase in milk yield helped to offset this rise. The cost of herd replacement increased by £59 over the previous year to a total of £266 per herd.

The second part of the report shows that the percentage of tuberculin-tested herds increased. Annual yield increased from 626 gal. in 1945-1946 to 730 gal. in 1949-1950, a 16-6 per cent. rise. Net

cost rose from £57 7s. 7d. to £71 4s. 10d. per cow and from 22-02d. to 23-44d. per gal. over the period, and profits from £12 19s. 5d. to £31 18s. per cow or from 4-97d. to 10-49d. per gal. Increased profits were chiefly the result of increased yields and improved managerial efficiency, since these led to lower cost per gal. Increase in herd size led to lower cost per gal. and increase in profit per gal., per head and per year. Over the period the average profits for winter milk were £12 7s. 11d. per cow compared with £10 12s. 10d. for summer milk, or 9-79d. and 6-92d. per gal., respectively.

W. Thomson.

2642

IMPER, A. D. and HAUGHS, M. A. **Report on the production of milk 1951-52. Aberdeen and district milk marketing board area.** *North of Scotland Coll. Agric., Agric. Econ. Dept. Rep.* No. 25, March 1953, pp. 20.

Records of 42 farms where milk production was the main enterprise were studied. The farms, all within the Aberdeen and District Milk Marketing Board area, ranged from 49 to 740 acres, the average size being 169-64 acres with an average rental of £1 4s. 4d. per acre. The average capital employed per cow was £60 18s. 11d., of which £5 19s. 8d. was for dairy equipment. The 42 herds totalled 1803 cows with an average yield of 814-02 gal. All the herds were machine-milked. Only 12 herds were entirely run by hired labour, and 6 by the farmer's family, the remainder by a combination of hired and family labour. The average net cost of keeping a cow for the year was £83 14s. 1d. and the net cost of production per gal. 2s. 1d. Profit per gal. ranged from 6½d. for herds with an average of less than 700 gal. to 1s. 1½d. for herds averaging over 900 gal. The average profit per cow was £36 8s. 1d. and the average profit per gal. was 10½d. Profits were above average in all the herds with a production over 800 gal. per cow per year.—E. L. B. Haskew.

2643

IMPER, A. D. and HAUGHS, M. A. **Report on the production of milk 1951-52. North of Scotland milk marketing board area.** *North of Scotland Coll. Agric., Agric. Econ. Dept. Rep.* No. 26, April 1953, pp. 10.

Completed records of 18 farms within the North of Scotland Milk Marketing Board area were studied. Milk production was the main enterprise, but type and size of herd varied considerably, Ayrshires being the predominating breed. The average capital employed per cow was £60 5s. 6d., of which £7 8s. 2d. was for dairy equipment. The average milk yield per cow was 647-44 gal. Hand milking was still practised on 2 farms. The average net winter cost was £52 2s. 2d. per cow and 3s. 8½d. per gal. and the average net summer cost £32 16s. 9d.

per cow and 1s. 7½d. per gal. The net annual cost of production for graded milk and ungraded milk was 2s. 5¼d. and 3s. 4d. per gal., respectively, the average net cost of production per gal. being 2s. 8¼d. The average net cost of keeping a cow for the year was £85 1s. 6d.—E. L. B. Haskew.

2644

GODFREY, D. **Dairying in Caithness.** *North of Scotland Coll. Agric., Agric. Econ. Dept., Econ. Rep. No. 37, November 1953, pp. 31.*

Over 60 per cent. of the dairy farms in Caithness have less than 30 cows but the density of stocking, owing to greater numbers of sheep, is higher than on the average Scottish dairy farm. Production costs were higher than elsewhere because of medium yield per cow (637 gal.), low yield of oats and high transport costs. The investment per cow was £104, but greater emphasis on winter milk production would increase receipts. Over 60 per cent. of the receipts were from dairying and 12 per cent. from sheep. It is considered that owing to its geographical and climatic conditions Caithness is not specially suited to dairying, and it is postulated that in any future emergency enough milk could be produced nearer the main centres of population, so avoiding the heavy transport costs from Caithness.—W. Thomson.

2645

WITNEY, D. and ROWBOTTOM, J. D. **Dairy labour in the east of Scotland.** *Edinburgh and East Scotland Coll. Agric. (Dept. Econ.) Bull. No. 37, March 1953, pp. 34.*

This study of 64 dairy farms outlines the terms of service for dairy workers, their hours, wages and financial incentives and housing. On all farms the wages were higher than the statutory minima. Bonuses, on a gallonage, clean milk or stock basis, or on a combination of these, were paid on 20 of the 64 farms studied and the advantages and disadvantages of these bonuses are discussed.—W. Thomson.

2646

BARKER, A. S. and HADDEN, M. A. **Self-sufficiency in milk production. A case study.** *Imperial Chemical Industries, Ltd., Agric. Development Dept. Bull. No. 4, August 1953, pp. 27.*

This is a description of the development and management of a dairy farm in Northern Ireland which is entirely self-sufficient. Only grazing and grass silage are now used for the maintenance of the herd and the production of milk. The figures presented show the increased production per acre and profit per cow over 5 years from 1948 to 1953. Pastures are kept in good condition by liberal fertilising. In 1951 it was found possible and

profitable to stop the purchase of concentrates as unnecessary.—T. D. Bell.

2647

KOIVISTO, E. Tutkimuksia Suomen kulutusmaito-markkinoista erikoisesti kulutusmaidon hinnanmuodostumisen kannalta katsottuna. [The market for liquid milk in Finland, with special reference to the market price.] *Acta agral. fenn.*, 1953, 82, pp. 161. German summary.

The object of the investigation was to clarify the problem of marketing fresh milk in Finland. In particular the effects of the second world war and the conditions in the subsequent years on supply of milk to the cities, region of production, means of transport, and use to which the milk was put on reaching the cities, *i.e.*, the relative proportions of the milk sold fresh and going to creameries for processing, were studied. For this purpose the data available for Helsinki were used.

A statistical examination was made of all the data. It covered seasonal variations in sale price of the fresh milk, its relation to cost of production, the effect of price on quantity purchased and the relation between demand and the income of the purchaser. It was found that milk consumption depended on two independent variables, the income and the numbers in the household.

The milk supply to Helsinki was at its lowest in 1945, amounting then to only 44 per cent. of that in 1938. After 1945 it rose quickly and in 1951 had reached 120.4 million litres, exceeding the figure for 1938 by 11.2 million litres. Yet the supply per head of the population was only 0.88 litre daily as compared with 1.08 in 1938. Supplies of butter and cheese as supplements, when calculated as milk equivalents, were 26.6 per cent. of total supplies in 1947, but had fallen to 10.8 per cent. in 1950 and risen again to 24.3 per cent. in 1951. Reasons for these variations are discussed. Though there were marked seasonal variations in supplies of fresh milk reaching Helsinki, these were smoothed out to a considerable extent by these supplies of milk supplements.

A weekly variation in milk sales was noted. Taking the average sales on Wednesdays as 100, those on Saturdays were 148 to 170 and on other days 104 to 107.

Owing to alterations in transport conditions and the increase in motor transport, supplies of fresh milk as well as of butter and cheese have been reaching Helsinki from more remote provinces and at the present time only 5.6 per cent. of the milk is reaching the city by rail.

All the changes in milk supply and demands and the conditions affecting them are examined on the basis of elasticity coefficients. (From summary.)

W. Godden.

N.A. and R., April 1954

2648

GÉNIN, G. L'industrie laitière dans le monde. [World milk industry.] *Lait*, 1953, 33, 401-406.

2649

BRANDOW, G. E. Changes in milk production in the United States 1924-51. *Pennsylvania Agric. Exp. Stat. Progr. Rep.* No. 97, February 1953, pp. 15. [Pennsylvania State College.]

2650

GRASHUIS, J. Gebruiksmogelijkheden van de ondermelk op de boerderij. [Possibilities of using skimmed milk on the farm.] *Landbouwk. Tijdschr.*, 1953, 65, 517-528.

A review.

2651

JONES, W. A. C. Cattle costs—winter 1952-53. *North of Scotland Coll. Agric. Econ. Rep.* No. 36, October 1953, pp. 17.

A total of 886 cattle made up of 24 groups of Aberdeen-Angus or its crosses, 2 groups of Short-horn crosses and 6 groups of other crosses were costed for the winter feeding period of around 26 weeks. Three groups were court-fed and the remainder stall-fed. The average cost was £18 4s. Eighty-five per cent. of the cattle were graded for slaughter as super-specials and the average profit was £9 11s. 6d. compared with £10 7s. for 1951-52 and £7 0s. 6d. for 1950-51, but returns varied from a loss of 6s. per head for one lot to a profit of £15 for 4 lots. Homegrown feeds accounted for 84.5 per cent. and purchased feeds for 4.6 per cent. of the total cost of 16s. 2d. weekly. There was an upward trend in both buying and selling prices.

Fifteen groups totalling 304 store cattle, mostly of Aberdeen-Angus origin, were costed throughout the winter period of 26 weeks. All were court-fed, generally on turnips and oat straw, with grass silage for 2 lots. Total costs ranged from £11 to £17 per head with an average of £14 15s. 6d. or 11s. 2d. weekly.

The wintering of 712 weaned calves on 34 different farms was studied for the 26-week period. On 12 Caithness farms the total cost per head was £15 15s., on 10 others outside Caithness but receiving the hill cattle subsidy £14 10s. 5d., on 7 in lowland areas £11 1s. 9d. and on 5 farms with calves from outwintered herds £10 16s. 5d. Homegrown feeds accounted for from 76 to 82 per cent. and purchased feeds for from 5.7 to 9 per cent. of the total cost. Costs are greatly affected by variations in the yield of oats and turnips. On 9 groups sold at the end of the period there was an average loss of £10 6s. 7d., excluding the subsidy of £15.—W. Thomson.

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2652

CAMBRIDGE UNIVERSITY SCHOOL OF AGRICULTURE, FARM ECONOMICS BRANCH. Profits in pig production. *Farmers' Bull.* No. 14, February 1953, pp. 23 + iii.

In the 47 enterprises recorded, individual farmers had up to 100 breeding sows or 300 fattening pigs. For every £100 gross output, average costs were £84, leaving a profit of £16. The best farmers made profits up to 30 per cent. of gross output but the worst made losses of nearly 10 per cent. Feed accounted for 84½ per cent. and labour for 9½ per cent. of all costs. The cost of producing a weaned pig was £2 10s. on the best farms, but the average was £4 10s.; costs could be greatly reduced by an increase in numbers weaned per sow per year. For fattening pigs the average meal requirement was 4.75 lb. per lb. live-weight increase, the best being 3.64 lb. Where potatoes or fodder beets were used the requirement was on the average 3.75 lb. meal equivalent. Grading and market prospects are discussed in the light of this survey. The effects of feed prices on costs of production and on ruling bacon prices are also discussed.—W. Thomson.

2653

ENGELMAN, G., DOWELL, A. A. and OLSON, R. E. Relative accuracy of pricing butcher hogs on foot and by carcass weight and grade. *Minnesota Agric. Exp. Stat. Tech. Bull.* No. 208, June 1953, pp. 48. [Dept. Agric. Econ.]

In the U.S. pigs for slaughter are usually sold on a liveweight basis. Thus animals of good carcass quality are generally not priced highly enough and farmers are overpaid for others of inferior quality. The object of the investigation reported was to estimate the relative accuracy in relation to carcass cut-out value of payment on the basis of liveweight, liveweight plus estimated carcass yield and estimated carcass grade, or carcass weight and grades.

The variability of cut-out values above and below the prices paid on the basis of the average weight of the lot of pigs was the pricing error. This was reduced by 16 per cent. when each pig was weighed and paid for individually and by 15 per cent. when estimates of carcass yield and carcass grade were made for each pig. In making these estimates, however, the buyer overgraded all pigs. A correction was made to allow for his inexperience and then this method reduced the pricing error by 38 per cent. A live grading method which gives no consideration to carcass yield was correct for 56 per cent. of the pigs and the pricing error was reduced by 43 per cent. When pigs were priced by carcass weight and grade the pricing error was reduced by 82 per cent. This

proved to be the most accurate price assessment studied.

The implications of a change-over to payment on a carcass weight and grade system are fully discussed. References are made to the bargaining for, and selling of pigs for slaughter, packing house reorganisation, the identification of bruised and diseased pigs and the probable acceptability, benefits, and difficulties of the change-over to producers, packers and consumers.—I. Lucas.

2654

HENNING, G. F. and EVANS, M. B. **Market hogs can be accurately graded.** *Ohio Agric. Exp. Stat. Res. Bull.* No. 728, June 1953, pp. 71. [Wooster, Ohio.]

This report is in 2 sections. The purpose of Section 1 was to investigate which carcass measurements were correlated with the percentage yields of the 4 trimmed lean cuts (hams, loins, picnics and butts), to estimate the shrinkage of carcasses after chilling and to develop carcass grades applicable to live pigs but based on carcass measurements. The purpose of Section 2 was to test the applicability in practice of the standards developed in Section 1.

The results from Section 1 indicated that most of the variation in yield of lean cuts could be correlated with variations in mean backfat thickness, length of carcass, length of hind leg and weight of carcass. Grades for live pigs were suggested which were based upon estimates by the grades of these 4 variables. The shrinkage data showed that after 24 hr. in the chill rooms light or lean carcasses shrank more than heavy or fat carcasses. If carcasses were kept in the chill rooms for 48 instead of 24 hr. the shrinkage increased by a further one-half per cent.

Section 2 reported wide variation in ability of graders to assess carcass quality accurately from live pigs. The best grader judged the quality of from 40.5 to 64.4 per cent. of the pigs in each lot accurately. Comparison of live grading with carcass grading revealed a slightly better accuracy for carcass grading. It was concluded that both live grading and carcass grading methods are

worthy of consideration in improving the system of marketing pigs in the U.S.—I. Lucas.

2655

SCHRADER, F. M. **The demand for meat in Canada.** Canada Dept., Agric. Marketing Serv., Econ. Div., July 1953, pp. 10. [Ottawa.]

2656

BRIZARD, H. **Le problème de la viande en Oubangui-Chari. Son évolution. Son importance économique et sociale.** [The meat problem in Oubangui-Chari. Its evolution and economic and social importance.] *Rev. Élevage Méd. vét. Pays trop.*, 1953, 6, 9–15.

2657

Cox, R. W. **Competition between butter and margarine, Minneapolis, 1952.** *Minnesota Agric. Exp. Stat. Bull.* No. 417, June 1953, pp. 16.

2658

CARPENTER, K. S. **Estimated cost of producing eggs, New York State 1926-1952.** *Cornell Univ. Agric. Exp. Stat. Bull.* No. 897, June 1953, pp. 28.

The total estimated cost of producing eggs ranged from 25 cents per dozen in 1940 to 53 cents in 1952. In these years feed costs were 13 and 32 cents, labour 4 and 9 cents, depreciation 4 and 6 cents and other costs 4 and 6 cents per dozen.

W. Godden.

2659

JASPER, A. W. and CRAY, R. E. **Consumer preferences, practices and demands in purchasing eggs and poultry in Columbus, Ohio.** *Ohio Agric. Exp. Stat. Res. Bull.* No. 736, October 1953, pp. 34.

This bulletin is based on interviews with a random sample of 300 housewives during September and October 1950, and gives information about egg and poultry consumption, purchasing habits and preferences. The annual consumption of eggs per head was estimated at 327. The information on poultry includes that for turkeys and geese.

W. Godden.

See also Abst. 2487.

DIET IN ETIOLOGY OF DISEASE

GENERAL

2660

ENGLERT, H. K., BAUER, H. and KUMMER, H. **Über die Fischmehlkrankheit des Schweines. [Fishmeal disease of pigs.]** *Arch. Tierernährung*, 1953, 3, 195–222. [Tierhyg. Inst., Freiburg i. Br.]

This is an account of co-operative work undertaken as the result of an outbreak of fishmeal

disease among fattening pigs from different stocks under test at the State research station, which was demonstrated to be due to feeding a particular fishmeal. After a survey of the literature, the progress of the disease and the clinical, pathological and histological findings are described. Eczema and hyperkeratosis of the outer skin and particularly of the mucous membrane of the tongue, not previously recorded, were prominent. A thorough

N.A. and B., April 1954

examination of the suspected fishmeal gave no clue to the cause of the disease. Vitamin B deficiency or any binding of the complex was excluded. Possible deficiency of vitamins A or C was not investigated.

In view of the economic importance of fishmeal in pig feeding it is considered that further attention should be given to the qualitative and quantitative methods used in the examination of fish-meals, in order that samples of poor quality or liable to contain products of decomposition of the raw material may be detected.—W. Godden.

2661

MASON, M. M. and GILVARG, C. **Bracken fern poisoning in Massachusetts.** *Vet. Med.*, 1953, **48**, 508-509. [Worcester, Mass.]

In a herd of cattle grazing on pasture, 4 of 10 calves developed chronic bloat. No cause for the condition could be found; the animals were provided with good clean pasture and overgrazing was avoided, and they gradually recovered without treatment.

Less than a month later, a cow from the same herd developed a temperature of 108° F., with profuse diarrhoea, and died within 24 hr. Autopsy revealed areas of subcutaneous haemorrhage and numerous petechial haemorrhagic areas on the surface and in the substance of lungs, heart, kidneys, gallbladder and urinary bladder, while the entire colon was filled with masses of clotted blood. Although no direct evidence was found to suggest that abnormal fodder had been ingested, there was much bracken in the district and a tentative diagnosis of bracken poisoning was made.

At this stage the entire herd was taken off pasture and fed on good hay and oats, but within 6 weeks 4 other adult animals developed similar signs and died.

The lack of any specific means for diagnosis and therapy in bracken poisoning is pointed out, and, no matter how intensely bracken may be fed, a long period is required to produce any sign, but deaths may continue for some time after animals are taken off bracken. It is suggested that bracken feeding may cause the production of some substance which is stored until a critical level is reached, when it precipitates fatal haemorrhagic disease.

W. A. Greig.

2662

BLAXTER, K. L. and WOOD, W. A. **Some observations on the biochemical and physiological events associated with diarrhoea in calves.** *Vet. Rec.*, 1953, **65**, 889-892. [Hannah Dairy Res. Inst., Kirkhill, Ayr.]

Information obtained in the course of a series of metabolic experiments with normal and scouring calves is summarised. Normal calves given milk

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or milk substitutes sometimes did not defecate for several days, but over long periods the average weight of faeces produced daily was 50 to 60 g., of which 15 to 20 g. was dry matter. In scouring calves faecal loss was much increased, averaging in severe cases 20 times, but sometimes as much as 40 times, the normal. In a series of 160 analyses of faeces from 8 calves, it was found that this increase was mainly accounted for by water, and indeed the percentage of dry matter in the faeces could be used as a measure of the intensity of the diarrhoea; but dry matter also was increased on the average by 7½ times. Apparent digestibility fell, sometimes to as low as 40 per cent., and fat-soluble vitamins were lost in greater amounts.

Free fatty acid excretion was enormously increased, on the average about 26 times; its increase was of the same order as that of the coliform count, indicating that the unabsorbed material had undergone bacterial fermentation. Steam-volatile fatty acids and "total fat" were increased about 6 to 7 times, and soaps 4 to 5 times. Excretion of purine N, probably of bacterial origin, rose from nil in normal calves to 270 mg. daily in scouring calves, and faecal pH fell from 6.8 to 6.0. Passage of feed through the digestive tract took 48 hr. in normal calves, but only 6 hr. in scouring calves.

In scouring calves, the increase in Ca, Mg and P excretion was of the same order as that of soaps, but in severe cases Na and K loss was about 11 times greater than normal, and was directly correlated with water content. K loss was particularly marked in animals losing weight. Despite these heavy faecal Na and K losses, urinary Na and K declined only slightly.

It is suggested from all this evidence that scouring arises from a primary disturbance high in the intestinal tract, which causes the formation lower down of a substrate of undigested food very suitable for massive bacterial fermentation. This leads to an increase in the number of small molecules and hence to increased osmotic pressure within the gut lumen, which in turn causes water and electrolyte infiltration. Acid irritation of the mucosa, increased motor activity, loss of the protective mucus from the intestinal wall and partial invasion of the gut by bacteria possibly contribute in the later stages. The part played by bacteria in the etiology of scouring may therefore be secondary in its inception, but not necessarily in its ultimate outcome.

As a cause of the primary digestive disturbance, the authors emphasise the importance of rennet clot formation and the influence on this of Ca ions.

W. A. Greig.

2663

HANCOCK, J. J. **Grazing behaviour in relation to bloat.** *Proc. N.Z. Soc. Animal Prod.*, 1953,

13, 127. [Dept. Agric., Ruakura Animal Res. Stat., Hamilton.]

A summary.

2664

HUNT, J. R. and BLAYLOCK, L. G. **Studies on enlarged hocks in turkey poults.** *Poultry Sci.*, 1953, **32**, 906. *Proc.* [State Coll. Washington, Pullman.]

2665

SHERWOOD, D. H. and SLOAN, H. J. **Studies with hock disorder in turkey poults.** *Poultry Sci.*, 1953, **32**, 923. *Proc.* [Univ. Minnesota, St. Paul.]

2666

FRITZCHE, K. Die Auswirkung der neuzeitlichen Geflügelfütterung und -haltung auf die Bekämpfung der Geflügelkrankheiten. [Effect of current practice in feeding and housing poultry on the control of poultry diseases.] *Arch. Geflügelk.*, 1953, **17**, 292-302. [Landes-Vet.-Untersuchungsamt, Rheinland-Pfalz.] English summary.

A lecture.

2667

MASOERO, P. Sterilità e habitat. [Sterility and habitat.] 6. I fenomeni periodici dell'habitat ed i bioritmi sessuali. [6. Periodic phenomena in the environment and sex rhythms.] 7. Parte quarta. Considerazioni conclusive. [7. Part 4. Final conclusions.] *Riv. Zootec.*, 1953, **26**, 248-251; 287-288. [Ist. Zootec. Gen., Univ. Turin.]

For previous parts see Absts. 5323, Vol. 23 and 923, Vol. 24.

See also Abst. 2165.

DEFICIENCY DISEASES

2668

HARVEY, J. M. and SUTHERLAND, A. K. **Parenteral copper therapy in ruminants.** *Austral. Vet. J.*, 1953, **29**, 261-268. [Dept. Agric. Stock, Brisbane, Queensland.]

Because previously accepted methods of giving copper all have disadvantages, a parenteral method, suitable for use in the field, was sought. Intravenous injection was not considered, as it would be impracticable for stock owners.

Copper-deficient sheep and cattle were used to test 13 Cu compounds given by subcutaneous injection. The percentage retention and degree of storage of Cu from each inoculum was estimated from auto-controlled balance studies or from pre- and post-treatment liver biopsies, or by both methods. Blood Cu values, estimated both before and at intervals after Cu administration, were used

as guides to uptake and toxicity. The inocula were designed to contain 50 mg. Cu for sheep and 200 mg. Cu for cattle.

Ten readily ionisable Cu compounds administered subcutaneously to sheep all produced damage at the site of inoculation, but with copper oxine (8-hydroxyquinoline), copper versenate (ethylenediamine tetra-acetate) and copper glycinate (aminoacetate) cuticular lesions were very slight. The oxine, however, was so insoluble that it was not metabolised, and the versenate proved extremely toxic. The glycinate was satisfactory in doses of 50 mg. Cu, but toxic in doses of 100 mg. Cu. Intramuscular injection of copper sulphate was satisfactory provided the whole inoculum was lodged in a muscle mass.

With cattle, 200 mg. Cu as the sulphate injected intramuscularly produced no ill effect in 3 bullocks, but caused lameness, inappetence and reduced milk production in 6 dairy cows for 48 hr. Their blood Cu values were raised and maintained for 5 months.—W. A. Greig.

2669

WALSH, T., NEENAN, M. and O'MOORE, L. B. **The importance of molybdenum in relation to some cropping and livestock problems under Irish conditions.** *J. Dept. Agric., Éire*, 1951-52, **48**, 32-43. [Soil Lab., Dept. Agric.]

This is a preliminary report. A condition in livestock, similar to that described elsewhere as conditioned copper deficiency, is relatively widespread. It responds to treatment with Cu, but pastures are not low in Cu. The Mo content of affected pastures ranges from 5 to 25 p.p.m. Total soil Mo values are normal, but the percentage of total Mo which is readily available is high. The condition occurs on both mineral and organic soils. In general affected soils are within the pH range 6.8 to 7.8. Both lime and phosphates, especially monocalcium phosphate, increase the Mo content of herbage. High Ca:P ratios in herbage are associated with the condition in livestock. Clovers have a higher uptake of Mo from soil than grasses and weeds.

It is noted also that soil from selenium-toxic areas is high in available Mo.

Mo deficiency in crops is another aspect of the Mo problem in Ireland. This is briefly considered. Fertilising with copper sulphate has an adverse effect on Mo-deficient crops; liming or treatment with Mo is beneficial.—F. C. Aitken.

2670

GRASHUIS, J., LEHR, J. J., BEUVERY, L. L. E. and BEUVERY-ASMAN, A. **Mangaandeficiëntie bij rundvee. [Manganese deficiency in cattle.]** *Inst. Moderne Veevoeding "De Schothorst"*, 1953, pp. 16. English summary.

N.A. and B., April 1954

A syndrome of poor growth and bone deformities, with low fertility, described by Bentley and Phillips (Abst. 2818, Vol. 21) in heifers and attributed to deficiency of Mn, is thought to be common on Netherlands farms where the pH of the soil is high. The quality of the pasture is otherwise good and a top-dressing of Mn removes all trouble. Details are given of a series of soil and pasture analyses and analyses of organs from 2 heifers, of which one showed characteristic abnormalities, from a typical farm.—I. Leitch.

2671

RODRÍGUEZ MORENO, F. F. Modificación del tiroideo en la profilaxis del bocio endémico por la sal yodada. [**Changes in the thyroid in prophylaxis of endemic goitre with iodised salt.**] *Rev. clín. española*, 1953, **50**, 270-285. [Hosp. Cantonal, Aarau, Switzerland.] English, German and French summaries.

To assess the prophylactic effect of iodised salt against endemic goitre in the Canton of Thurgau in Switzerland, anatomical studies were made of thyroids of 182 calves from 3 districts differing in intake of I. In one district 60 per cent. of the salt consumed contained 5 mg. KI per kg.; in the other districts all the salt consumed had either 5 or 20 mg. KI per kg. With increasing amounts of iodised salt there was a reduction in the absolute and relative weights of the thyroids. Histological examinations indicated a parallel between weight and activity, inactivity being observed only when the weights of the glands were less than 0.6 g. per kg. bodyweight. Increasing amounts of I caused a reduction in the size of the follicles, made them more homogeneous and increased the size of the nuclei. Variations in the appearance of the nuclei also were observed, and their significance is discussed.—M. B. Richards.

2672

SARAZÁ ORTIZ, R. Antibióticos en la ración de la raza porcina colorada. [**Antibiotics in the diet of the red breed of pigs.**] *Zootecnia*, 1953, **2**, 203-206. [Fac. Vet., Córdoba.] English and French summaries.

The 2 groups of 5 pigs, aged 8 months, were suffering from advanced rickets. The experiment lasted 4 weeks, during which time the pigs which received procaine penicillin at 0.025 g. per kg. diet increased in weight by 84 per cent., and controls by 78 per cent. The difference was significant at 0.1 per cent.—D. Duncan.

See also Absts. 1730, 1744, 2139.

DISEASES OF METABOLISM

2673

BERRIER, H. H. (Jr.) **Pregnancy disease in sheep; a preliminary report on prophylaxis and treat-**

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ment. *Vet. Med.*, 1953, **48**, 405-409. [Dept. Vet. Pathol., Univ. Missouri, Columbia.]

The clinical signs, pathology and physiology of pregnancy disease are described and treatment of 8 ewes with ketogestin, a hormone related to cortisone, is reported. The therapeutic and prophylactic use of ketogestin is discussed.—T. D. Bell.

See also Abst. 1728.

POISONS OCCURRING IN FOOD

2674

HARVEY, J. M. **Further studies of fluorosis in Merino sheep.** *Queensland J. Agric. Sci.*, 1953, **10**, 109-124. [Biochem. Sect., Chem. Lab., Div. Plant Indust.]

Six sheep, which in a previous experiment (Abst. 1408, Vol. 24) had been pen-fed and given drinking water containing 10 or 5 p.p.m. F, were given for 30 months drinking water containing not more than 0.2 p.p.m. F. During this time they had access to pasture and alfalfa hay. The incisor teeth were examined monthly and after autopsy at 57 months of age X-ray studies were made of femur, tibia and mandible and F was estimated in muscle, kidney, bones and teeth.

Comparison of the results with those obtained at 37 months from similar sheep immediately after exposure to F indicated that the dental lesions of fluorosis are permanent and that the effects of erosion and wear are enhanced by age despite later protection from F. The bone defects previously reported are apparently not permanent.

F. C. Aitken.

2675

LEE, H. J. and KUCHEL, R. E. **Phalaris tuberosa and phalaris staggers in sheep and cattle. Investigational work on phalaris staggers in sheep.** *J. Dept. Agric. S. Austral.*, 1953, **56**, 493-495 (with discussion 495-498). [Div. Biochem., C.S.I.R.O.]

For previous article see Title 1414, Vol. 24.

Sheep were kept on 3 pastures: subterranean clover, 22 ewes, 11 receiving 7 mg. Co per head weekly; alfalfa, 22 ewes, 11 receiving the Co supplement; mixed pasture including subterranean clover, alfalfa and *Phalaris tuberosa*, 25 ewes, 10 receiving the Co supplement. No ewe developed staggers on the first 2 pastures; 11 of the unsupplemented ewes on the mixed pasture developed staggers, but none of the ewes given Co.

The protective effect of frequent doses of Co was confirmed in a second series of tests. A massive but infrequent dose, 280 mg. Co per sheep at intervals of 4 weeks, did not prevent staggers.

It is suggested that the Co exerts its protective effect by increasing production of vitamin B₁₂ in the animal body and allows the animal to destroy more rapidly the toxic substances present in *Phalaris*. The work continues.—P. C. Jowsey.

2676

WHITEHEAD, E. I. and MOXON, A. L. **Nitrate poisoning.** *S. Dakota Agric. Exp. Stat. Bull.* No. 424, June 1952, pp. 24.

Nitrate in feedingstuffs is reduced to nitrite by the micro-organisms of the gastro-intestinal tract of animals. The nitrite converts the haemoglobin of the blood to methaemoglobin and if the change is pronounced enough the animals may die of asphyxiation.

Oat, barley, wheat or rye hay, maize and sorghum fodder all may contain toxic amounts of nitrate when environmental conditions have been unfavourable to normal plant growth. Drought is particularly conducive to the accumulation of nitrate. Young plants often contain large amounts of nitrate, which decreases as the plants mature. Herbicide sprays may also increase nitrate in leaves. Beet leaves inadvertently sprayed with 2, 4-D contained on the average 4.50 per cent. KNO_3 on a dry matter basis, unsprayed leaves only 0.22 per cent. Other conditions affecting nitrate accumulation in plants are the nitrate content of the soil and the presence or absence of certain trace elements essential to enzyme function.

Nitrate poisoning in livestock has been successfully treated by intravenous injections of a solution of methylene blue or of thionine. The latter is itself toxic above a certain level.

Nitrate poisoning in infants was traced to well-water which contained up to 801 p.p.m. nitrate N. Water containing more than 10 p.p.m. nitrate N is considered unsafe for infant feeding. Treatment is by injection of methylene blue or large doses of ascorbic acid given intramuscularly or subcutaneously.—P. C. Jowsey.

See also Abst. 2143.

MICRO-ORGANISMS OCCURRING IN FOOD

2677

FORGACS, J., CARLL, W. T., HERRING, A. S. and MAHLANDT, B. G. **Toxic fungus isolated from feed pellets.** *Vet. Med.*, 1953, **48**, 410-411. [Camp Detrick, Frederick, Md.]

2680

HALDEN, W. *Grundlagen der Ernährung—Fundamente des Lebens.* [Bases of nutrition, foundation of life.] Leopold Stocker Verlag, Graz, 1952, pp. 123.

This is a simple, clearly written elementary textbook of diet. It is intended for the non-scientific reader and, with the help of a number of pictorial semi-diagrams, of which some are very good, it does well in the difficult task of explaining a com-

Aspergillus clavatus isolated from a pelleted feed was grown on whole maize in an incubator for about 15 days. The maize was then dried and ground.

Three calves given, by stomach tube, water suspensions of the ground maize developed hyperkeratosis and died. The toxic principle appeared to be an antibacterial substance soluble in ethylacetate, and an attempt is being made to isolate and purify it.—P. C. Jowsey.

IMMUNITY

2678

USUELLI, F. and PIANA, G. **Fattori alimentari e genetici nella profilassi delle malattie infettive.** 6.7.8. [Diet and genetic factors in the prevention of infective diseases. 6.7.8.] *Riv. Zootec.*, 1953, **26**, 245-247; 282-286; 313-317.

6. A review of literature on experimental and clinical observations on the importance of vitamin C in resistance to disease is given. Most domestic stock can synthesise the vitamin, but it may be destroyed in the rumen. The connection between the adrenal secretions and vitamin C are considered.

7. Diseases of livestock are discussed from the point of view of their hereditability.

8. The theory of the inheritance of immunity is discussed, and practical methods for its application are proposed. The previous papers in the series (see Absts. 5352, Vol. 23; 295, Vol. 24) are summarised with stress on the importance of balanced and adequate diet for general condition and the formation of antibodies.—T. D. Bell.

2679

PRICE, D. A., HARDY, W. T. and BOUGHTON, I. B. **Phenothiazine-salt mixture, free choice, for the control of the large stomach worm in range sheep.** An 8-year study conducted under the natural range conditions of the Edwards Plateau. *Texas Agric. Exp. Stat. Bull.* No. 766, July 1953, pp. 7.

See Abst. 1417, Vol. 24.

See also Abst. 1715.

7. BOOK REVIEWS

plicated subject to such readers. Except for one picture of a child with vitamin A deficiency and a paragraph about kwashiorkor, no use is made of the drama of deficiency disease, so that it is the more difficult to make the subject interesting. Apart from the statements that vitamin A is required for the utilisation of fat and vitamin C for the utilisation of protein, for which we know of no evidence, simplicity and accuracy are well combined.—I. Leitch.

2681

HALDEN, W. *Der Ganzheitsgedanke in der Ernährung.* [The concept of completeness in diet.] *Die Bodenkultur*, 1952, 6, 383-394.

This general article summarises the contents of the book "Grundlagen der Ernährung—Fundamente des Lebens" (see preceding Abst.) with special reference to the virtues of a diet of natural foods, not injured by processing.

I. Leitch.

2682

FRUTON, J. S. and SIMMONDS, S. **General biochemistry.** J. Wiley and Sons, Inc., New York, 1953, pp. xii + 940. Price 80s.

2683

CLIFTON, C. E., RAFFEL, S. and BARKER, H. A. (Eds.) **Annual review of microbiology. Volume 7.** Annual Reviews, Inc., Stanford, 1953, pp. x + 505.

2684

WHISTLER, R. L. and SMART, C. L. **Polysaccharide chemistry.** Academic Press, Inc., New York, 1953, pp. xv. + 493. Price 86s. 6d.

2685

STOOPS, R. (Ed.) *Les protéines. Rapports et discussions.* [Proteins. Reports and discussions.] R. Stoops, 76-78 Coudenberg, Brussels, 1953, pp. 350.

2686

NICHOLAS, D. J. D. **Chemical tissue tests for determining the mineral status of plants in the field.** Tintometer, Ltd., Salisbury, England, 1953, pp. 33. Price 8s. 6d.

2687

The Canada Year Book 1952-53. The official statistical annual of the resources, history, institutions, and social and economic conditions of Canada. Queen's Printer and Controller of Stationery, Ottawa, 1953, pp. xl + 1266. Price \$ 3.00.

2688

VOGL, A. **Diuretic therapy.** Baillière, Tindall and Cox, London, 1953, pp. xiii + 248. Price 38s. 6d.

The emphasis in this book is not nutritional, its sub-title being "The pharmacology of diuretic agents and the clinical management of the edematous patient". In that part which is devoted to practical treatment the different types of diets for restricting salt intake are described, and as the book has its origin in the United States of America

the menus are designed accordingly. Both the subject and its treatment may limit interest in the book to medical practitioners but its text and the very full bibliography contain many references of value to physiologists interested in the metabolism of water and electrolytes.—D. Harvey.

2689

COOPER, M. M. **Beef production.** T. Nelson and Sons, Ltd., London, 1953, pp. x + 234. Price 12s. 6d.

In view of the fact that the recently published February Price Review seems to indicate a swing of the pendulum in favour of beef production—long the Cinderella of British agriculture—this is a very timely book.

The first two chapters introduce the subject and deal with the history of beef cattle; there follow eight chapters covering the science and practice of genetics, breeding and nutrition. Three chapters deal with different types of beef enterprise, and the last chapter, "Economic Considerations", summarises the problems encountered and offers solutions. In general, the British beef industry, past, present and future, is discussed thoroughly in all its aspects.—E. L. B. Haskew.

2690

BOURNE, G. H. and KIDDER, G. W. (Eds.) **Biochemistry and physiology of nutrition. Volumes 1 and 2.** Academic Press, Inc., New York, 1953, pp. xiii + 569; xi + 641. Prices \$13 and \$15.

Their undertaking "to gather into one work the most salient segments of the vast amount of research dealing with the field of nutrition" has been achieved by the editors in the 23 chapters of this treatise written by 28 authors. It is a product of Anglo-American co-operation the measure of which is indicated by 11 chapters being from American, 1 from an Australian and 11 from British addresses. The extent of the subjects discussed may be judged from the list of nearly 5500 references to publications and from the size of the double-volume indexes, 86 pages for subjects and 69 for authors' names.

The range of subjects is wide. The history of the early development of the science is by the late E. P. Cathcart who, by his dietary surveys, pioneered in the application of the subject of this treatise to human welfare and whose recent death has meant a loss to physiological science in Britain. The history of vitamins is dealt with by Harris.

Chapters on water and electrolytes by Zwemer, carbohydrates by Sourkes, lipids by Frazer, iron by Kirkpatrick and calcium and phosphorus by Kirkpatrick and Robertson deal specifically with the metabolism of these constituents of foods; others on amino-acids by Meister, vitamin B

complex by Kon and Porter, vitamin C by Lloyd and Sinclair, fat-soluble vitamins by Moore, and trace elements by Underwood are wider in their treatment and are concerned also with the chemistry of these nutrients. Chapters on more specialised branches of biochemistry and physiology are by Borsook and Deasy on the biosynthesis of proteins, by Cuthbertson and Phillipson on the microbiology of digestion and by Jukes on vitamins and haematopoiesis. Considerable stress is laid on the subject of changes occurring in tissues in the chapters on energetics and metabolic function by Kennedy, on hydrolytic and phosphorolytic enzymes by Yudkin, on respiratory enzymes by Horecker and Kornberg and on co-enzymes by

Novelli and Soodak. The editors' own contributions are in different fields, Bourne's chapters on the localisation of enzymes and vitamins and on the structural changes in vitamin deficiency being largely histological and Kidder's on the nutrition of invertebrate animals being the subject in which probably most remains to be done. A final chapter by Goldsmith summarises the application of the science of nutrition to man.

The cost in time and thought to the contributors and editors of this authenticated handbook of nutrition must have been considerable; the cost in money to purchasers will also be high. Those wishing to benefit from the one may be deterred from doing so by the other.—D. Harvey.

8. FOOD AND AGRICULTURE ORGANIZATION (AND OTHER ORGANIZATIONS) OF THE UNITED NATIONS

Report of the Council of FAO. Eighteenth Session, 18–20 November 1953; Nineteenth Session, 12 December 1953. Rome, Italy, January 1954, pp. 40.

Monthly Bulletin of Agricultural Economics and Statistics. Vol. 2, No. 12, December 1953, pp. 48. Price \$0.50, p. 1. Some aspects of interchangeability among fats and oils. Vol. 3, No. 1, January 1954, pp. 32. Price \$0.50; No. 2, February 1954, pp. 48. Price \$0.50.

Grain exports by source and destination, July 1952–June 1953. Rome, Italy, November 1953, pp. 20. Price \$0.25.

Commodity Reports. Rice No. 4. Rome, Italy, December 1953, pp. 33. Price \$0.25.

Nutritional Studies No. 10. School feeding. Its contribution to child nutrition. Rome, Italy, November 1953, pp. v + 129. Price \$1.00.

The history of school feeding from its charitable beginnings to its present position as a social responsibility is traced and brief summaries are given of the many experiments and schemes which have been put into operation all over the world. Most of these have been based on milk but useful data have been collected for other supplementary foods in areas where milk supplies were inadequate. The administration of such schemes is described and their educational and social aspects are considered in the light of arguments both for and against them. The operation of school meals services requires quantities of food which may range from the produce of a school garden to surplus supplies the accumulation of which may have an effect on farm prices. The disposal of such stocks in this most profitable manner may not only be of national importance but may, as the work of UNRRA and UNICEF has shown, have international implications. A final chapter deals with the extension of the work to the more vulnerable pre-school child. There are appendices which

describe the work geographically, give notes on the use of dried milk and summarise the methods of evaluating the results obtained from supplementary feeding.

FAO Nutrition Meetings Report Series No. 6. Report of the Nutrition Committee for South and East Asia. Third meeting, Bandung, Indonesia, 23–30 June, 1953. Rome, Italy, November 1953, pp. iii + 38. Price \$0.40.

Progress made since the second meeting of the committee (see p. 516, Vol. 20) is reported. In Indonesia where most of the rice used is home pounded beriberi is not a problem but in Thailand where polishing has been introduced the disease has appeared. The consumption of under-milled rice is being encouraged throughout the area and care in washing and cooking of the cereal is advised. Improvement of rice diets is urged by the use of fish in India and Japan, of pulses and groundnuts in the Philippines and of silk worm chrysalis, a food local to North Viet Nam.

The malnutrition of mothers, infants and children with regard to protein is considered in detail. The differences between severe kwashiorkor as described by the Joint Expert Committee on Nutrition (see next abstract) and protein deficiency disease in children in South and East Asia are described and reference is made to the important part which the nutrition of the mother may play in its causation. The long-term effects on the health of the adult populations are not fully understood and suggestions for field, laboratory and chemical research are advanced. The parts which food production, distribution and processing may play in its prevention are described.

Endemic goitre occurs in India, Indochina and Thailand and has a high incidence in parts of Indonesia. The use of iodates in prophylaxis is recommended. The importance of calcium in human nutrition is also emphasised but, until more information becomes available, no recommendations are put forward for allowances; it is, however, suggested that the Ca content of local diets should be increased. Brief reference is made to deficiencies of vitamin A and riboflavin in the diets of the populations.

N.A. and R., April 1954

The activities in the various territories for education in nutrition and the training of workers for nutrition programmes in communities and schools are dealt with in full.

World Health Organization. Technical Report Series No. 72. Joint FAO/WHO Expert Committee on Nutrition. Third Report. Session held at Fajara, Gambia, 28 Nov.-3 Dec. 1952. Geneva, December 1953. Price \$0.20. Issued also as FAO Nutrition Meetings Reports Series No. 7.

This report is concerned with deficiency of protein in the diet of infants and children, a subject the further study of which was recommended at the second session (see p. 1016, Vol. 21). It is considered from a number of aspects: its cause, namely food supply, population growth and economic status and social customs; its extent both in incidence and in long-term effects; its treatment which is largely dietetic; and its prevention by changes in the diet of the population as a whole or by the special feeding of pregnant and lactating women and infants.

But the kernel of the problem is reached only when the practical application of programmes to improve nutrition is considered. In this connection emphasis is laid on the need for local surveys to discover what the people know already, to gain their confidence, and to instil in them a feeling that their problems are being approached sympathetically. Integration with the local beliefs and customs of plans for improvement will do much to encourage their adoption. A number of lines along which field, clinical and laboratory researches might proceed are indicated.

The report ends with appendices giving a description of severe kwashiorkor, a list of no fewer than 38 names which have been applied to the syndrome and a general

note on food production and the extension methods likely to help bridge the gap between science and practice.

Development Paper No. 38. Manual of field studies on the heat tolerance of domestic animals. Rome, Italy, December 1953, pp. x + 161. Price \$2.00.

The origin of the plans and techniques described in this manual may be traced to recommendations made in the earlier Development Papers Nos. 6, 8 and 33. In the meantime the methods proposed have been examined by the author, Dr. D. H. K. Lee, and by a panel of experienced investigators. Two chapters deal with specific techniques for the study of environmental conditions and four with various aspects of the study of animal reactions. It is hoped that the manual, which is in no way intended to be a final statement of methods to be employed, will have the effect of encouraging investigators to make their observations according to an agreed plan and it is only with this systematic collection of data that it is concerned. The much more complex subjects of the integration and interpretation of findings are not considered.

If the aim of FAO in arranging for its compilation is to be attained the manual will need to be in the hands of all who are interested in the problems of the animal breeder and producer in the tropics.

Material on Home Economics and its Teaching. Rome, Italy, 1953. Mimeographed, pp. 152. Price \$0.50.

The material supplied by member governments in response to a request by FAO for information on Home Economics programmes, methods of evaluation of teaching and on teaching aids has been analysed and classified. The tables give title, date, form, author and language of the publications and the address from which copies of each may be obtained.

9. DEPARTMENTAL AND OTHER REPORTS

AUSTRALIA.

Annual Report of the Department of Agriculture and Stock, Queensland, for the Year 1952-53. Pp. 118.

Copper deficiency and steely wool.
Hand-feeding of sheep in drought time.
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THE SEA AND WORLD FOOD SUPPLIES

BY

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FOOD AND AGRICULTURE ORGANIZATION OF THE UNITED NATIONS, ROME

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INTRODUCTION

IN a world in which the arable land areas have been almost fully explored, the food production capacities of the seas with their three dimensions have, until recently, attracted singularly little attention. Perhaps this is understandable because, in the past, populations had not saturated the habitable areas, and emigration relieved population pressures to an extent which today is growing more and more difficult to achieve. The time has come when mere multiplication of mouths has forced attention on to this last of the unexplored possibilities.

This time would have come, though much more slowly, had it not been for the impact of two great wars and especially of the last one. It has, of course, long been recognised that the low level of production and consumption in the underdeveloped areas and the great disparity in this respect between them and the more highly developed areas constitute the most serious aspect of the food problem. And it had long been known that the rate of human multiplication and survival was increasing. But the effect of the second world war was to aggravate and intensify these problems. Territories were laid waste, livestock was killed, stores and processing facilities were destroyed and many of the most productive areas of the sea were almost completely closed to fishing.

The impact of this produced, in many places, widespread shortage, and in some places downright starvation. Though this decreased survival, it did not reduce birth rates, and populations continued

to grow as if the resilience of the human animal responded to the challenge of impending death.

All this brought the food problem nearer to the point where man could no longer fail to marshal his efforts towards a unified attack upon it. Thus, out of the economic and political disequilibria there grew the attempt to bring nations together to face the food problem which they had in common, first through the old League of Nations and then, on a much larger scale and with broader terms of reference, in the Food and Agriculture Organization of the United Nations* established in 1945. Sired by Hope out of Misfortune, FAO constitutes a response to the stresses brought about by the challenge of this uneasy history. It arose, as did other organisations of this kind, from a growing awareness of interdependence and is a step, though perhaps a tentative one, towards the achievement of some sort of order and management in man's affairs.

THE STATE OF WORLD FOOD SUPPLIES

It will be appropriate at this point to glance at the state of world food supplies, to examine the needs and subsequently to consider what contribution aquatic resources are making, and might make, to the solution of the food problem.

The total food production of the world, based upon the 1952/53 figures (Food and Agriculture Organization of the United Nations,* 1953a) is estimated to have regained the pre-war level per head of the population. As will be seen from

* Hereafter briefly referred to as FAO.

Table 1, the provisional estimates for 1952/53 show an increase of 17 per cent. over the pre-war average in both food production and population.

TABLE 1
INDEX NUMBERS OF VOLUME OF AGRICULTURAL AND
FOOD PRODUCTION*
(FAO, 1953a)

Region	1948/49- 1950/51	1951/52 1934-38 = 100	1952/53 ‡
Total Agricultural Production			
North Western and Southern Europe	104	114	113
North America	136	136	143
Latin America	122	120	130
Oceania	112	108	119
Far East (excluding China)	98	101	102
Near East	115	125	134
Africa	124	134	137
All above regions	114	118	123
World†	109	113	117
Food Production			
North Western and Southern Europe	104	114	114
North America	139	138	146
Latin America	127	124	134
Oceania	112	106	118
Far East (excluding China)	99	100	103
Near East	115	124	133
Africa	123	132	134
All above regions	115	119	123
World†	110	113	117
Population			
World (excluding U.S.S.R., Eastern Europe and China)	118	121	123
World†	112	115	117

* For an explanation of the basis on which these indices are calculated see p. 125 of the reference.

† Including estimates for U.S.S.R., Eastern Europe and China.

‡ All figures for 1952/53 are provisional.

But these figures of overall production and increases are misleading in that they do not reveal the unevenness of the increase. For instance, nearly half of the increase in world agricultural production since 1934-38 occurred in North America alone, a region which supports only 7 per cent. of the world's population. At the other extreme, the Far East, with about half the world's population, has only maintained its pre-war level of production. Other regions have made a good deal of progress. Latin America, the Near East and

Africa are all producing about one-third more than they did in the pre-war years, and Europe and Oceania have increased their production by from 10 to 20 per cent.

The unevenness of present-day food production is associated with uneven rates of population increase, and hence uneven basic food requirements, in many parts of the world. It is estimated that in Europe and the U.S.S.R. the increase in population has been of the order of 10 per cent. of the 1934-38 average. In China, it has been less than 5 per cent. On the other hand, the Far East (excluding China), North America, Oceania, Africa and the Near East have all increased their population by about 25 per cent., and Latin America by no less than 40 per cent. over the 1934-38 average.

On the per head basis it appears that food production is somewhat above the pre-war level in Europe, Africa and the Near East, and somewhat below it in Latin America and Oceania. In two regions of the world the change in production per head is much more striking. In North America it shows an increase of between 15 and 20 per cent.; in the Far East it is from 15 to 20 per cent. below the pre-war average.

However, the indices used in the above computations tell nothing of the quantities of food produced in the several regions, and the level of production per head reflects only in a general way the level of food consumption. Food consumption cannot be separated from purchasing power. In countries like North America, only about from 30 to 40 per cent. of the wage-earner's income is spent on food; in the Far East most of the resources of the wage-earner are used to obtain a diet which even then is inadequate for himself and his family.

In the underdeveloped areas where population pressures are greatest, the most serious difficulty lies in the quality of the diet, which is characterised by a low level of protective foods. There is no relatively simple unit, such as the calorie, available for the measurement of the quality of diets, and the protein content is perhaps the best available indicator, because most foods rich in protein are also comparatively good sources of other essential nutrients. Since this is particularly true of foods of animal origin, the animal protein intake is probably better than the total protein intake as an indicator.

Table 2 shows a comparison between the pre-war energy and protein content of national average food supplies and those of 1951/52.

It will be noted from this table that in Latin America, with the exception of Argentina and Uruguay, the animal protein intake is low; in Europe it is low in Greece and Italy, and in the Far East and the Near East countries it is very low indeed. It is here that the most serious qualitative

TABLE 2

ESTIMATED ENERGY AND PROTEIN CONTENT OF NATIONAL AVERAGE FOOD SUPPLIES PER HEAD BEFORE THE WAR AND IN 1951/52 (adapted from FAO, 1953a)

Country	Calories		Total protein		Animal protein	
	Pre-war	1951/52	Pre-war	1951/52	Pre-war	1951/52
	Number daily		g. daily		g. daily	
NORTH AMERICA						
Canada . . .	3010	3020	84	91	48	56
United States . .	3150	3160	89	91	50	61
SOUTH AMERICA*						
Argentina . . .	2730	3160	98	102	62	67
Brazil . . .	..	2300	..	59	..	16
Chile . . .	2240	2400	69	74	21	26
Colombia . . .	1860	2400	47	56	20	32
Honduras . . .	..	2030	..	57	..	18
Mexico . . .	..	2210	..	61	..	16
Peru . . .	..	2220	..	63	..	14
Uruguay . . .	..	3070	..	101	..	65
Venezuela . . .	..	2200	..	67	..	29
EUROPE						
Austria . . .	2990	2660	88	78	39	36
Belgium- Luxembourg	2820	2930	84	86	34	40
Denmark . . .	3420	3220	91	91	57	51
Finland . . .	3000	3330	95	104	44	52
France . . .	2830	2750	93	92	39	41
Germany, Western	3070	2760	84	76	42	37
Greece . . .	2600	2490	84	77	23	17
Ireland . . .	3400	3480	99	96	48	48
Italy . . .	2520	2480	82	78	20	21
Netherlands . .	2920	2890	87	80	44	40
Norway . . .	3200	3060	90	96	49	53
Sweden . . .	3120	3090	95	93	59	59
Switzerland . .	3140	3180	96	96	54	52
United Kingdom	3120	2990	83	85	46	43
FAR EAST						
Ceylon . . .	2140	2010	48	53	9	12
India . . .	1970†	1620	56†	43	8†	6
Japan . . .	2180	2100	64	53	10	10
Pakistan . . .	..	1970	..	54	..	11
Philippines . .	1920	2060	45	42	11	11
NEAR EAST						
Egypt . . .	2450	2350	74	69	9	13
Turkey . . .	2450	2560	79	82	13	15
AFRICA						
Union of S. Africa . .	2300	..	68	..	23	..
S. Rhodesia . .	..	2280	..	69	..	17
OCEANIA						
Australia . . .	3310	..	103	..	67	..
New Zealand . .	3260	3380	96	103	64	69

.. Not available.

* Figures refer to calendar year of earlier year mentioned.

† Including Pakistan.

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nutritional deficiencies occur and, as can be seen, there are also deficiencies of energy. In addition, it is becoming widely recognised that debilitating diseases such as kwashiorkor or similar syndromes are associated with low intake of protein and especially of protein of animal origin.

The contribution made by fisheries to the food supplies of the world is predominantly animal protein of high biological value, and it is now proposed to examine the magnitude of that contribution.

SUPPLIES OF FOOD FROM FISHERIES

One of the first tasks that confronted FAO was to institute a collection of statistics of world fisheries and to report them in summary form and uniform terminology. Its most recent *Yearbook of Fisheries Statistics* (FAO, 1953b) covers the available information for 1950-51. These data include all material furnished by national governments and conservative estimates of the yields of the subsistence and sport fisheries for which exact figures are not available. Estimates have also been made for the U.S.S.R., from which no statistics are available to FAO.

Table 3 shows that the world production in 1950-51 was about 26 million metric tons, on the basis of the weight of the fish at the time it was caught.

To this must be added over 2000 tons of whales caught each year. But it must be remembered that the whale is caught primarily for its oil, and only a fraction of the protein is used (Kondrup, 1952). It will also be seen that slightly more than 10 per cent. of fish caught is used for the production of oil and meal. Fishmeal, because of its high protein content and the presence of vitamin B₁₂, is widely sought for animal and poultry feeding, and contributes indirectly to human food. The manufacture of these products consumes one-third of the African catch and one-fifth of the catch of Europe and North America.

The bulk of the world catch, because of its limited marketable life, is absorbed by domestic consumption, but developments in preservation and transport have gradually made a wider distribution possible, so that now some 20 per cent. of the world's catch enters international trade. Generally speaking, most of this trade is intra-regional, but some commodities are now exchanged inter-regionally. The developments in Scandinavia and South Africa, in particular, have brought these parts of the world to the position of net exporting regions. The most important individual countries with a net export (FAO, 1953b) are (1950 figures in metric tons): Canada (279,108), Denmark (81,041), French Morocco (78,661), Iceland (141,414), Japan (56,123), Netherlands (12,678), Norway (488,115), Union of South Africa and South-West Africa (44,498).

TABLE 3

ESTIMATED ANNUAL WORLD CATCH OF FISH, CRUSTACEANS AND MOLLUSCS, MID-TWENTIETH CENTURY, IN THOUSAND METRIC TONS

(Adapted from FAO, 1953b)

Species groups and their utilisation	World total	Africa	America North *	America South	Asia †	Europe †	Oceania	U.S.S.R.
SPECIES GROUPS								
All teleostean freshwater and brackish-water species	4600	100	100	100	3500	100	φ	700
Salmon, trout, and similar species	600	—	300	—	100	φ	φ	200
Sole, flounders, halibut, and other teleostean flat fishes	600	φ	100	φ	200	200	φ	100
Cod, hake, haddock, and similar species	3400	100	600	φ	300	2200	φ	200
Herring, sardines, pilchards and similar species	6400	400	1300	φ	2000	2100	φ	600
Tuna, true mackerel and similar species	1500	φ	300	200	700	200	100	φ
Other marine teleostean species ‡	5000	100	400	200	3000	800	φ	400
Sharks, rays, skate and other elasmobranchs §	500	φ	φ	φ	200	100	φ	φ
Crustaceans and molluscs	2700	100	700	φ	1500	300	φ	100
Bêches-de-mer, turtles, seaweeds, and other aquatic fauna and flora || . . . . .	600	φ	φ	φ	500	φ	φ	φ
Total	25,900	900	3800	500	12,000	6000	200	2300
UTILISATION								
Consumed fresh	11,600	300	1100	300	5800	2800	100	1200
Frozen	900	φ	500	φ	100	200	φ	φ
Cured	8300	200	500	100	5000	1500	φ	1000
Canned	1700	100	900	100	200	200	φ	200
Reduced to oils and meals	2700	300	800	φ	400	1200	φ	φ
Other purposes	700	φ	φ	φ	500	100	φ	100

φ Negligible, for the purposes of this table.

* Includes Central America.

† Excludes the U.S.S.R.

‡ For the purpose of this table this group includes: (a) barracudas, mullets and similar species; (b) jacks, pompanos and similar species; (c) perches, croakers, breams, basses and similar species.

§ For the purpose of this table this group includes ganoids: sturgeons and garfish.

|| Excluding aquatic mammals (baleen and sperm whales, dolphins, seals and the like).

It will be noted that countries with net exports are among the better developed, and when it is considered that most of the exports go to other well developed countries where purchasing power is high, it can be seen that in general the consumption in the underdeveloped areas, where the needs are greatest, has not been greatly affected.

Consumption of Fishery Products per Head

The problem of estimating the consumption of fisheries products per head presents many difficulties. Even in countries where advanced statistical services exist many assumptions have to be made, and for other areas methods of sampling must be resorted to and approximations made to the average annual consumption of fisheries products by each person.

Nutritionally the problem is further complicated by the fact that the pattern of fish consumption within a country is uneven. Most fish is consumed in places that are near the source of supply, on the borders of the sea or of inland water systems. People who live remote from these places usually eat less fish, with the occasional exception of those in large urban centres where communication and transport systems are much better than in rural areas.

But, taking world production and population as a whole, it will be seen that when the amount used for fishmeal and oil is deducted from the total catch, something less than 10 kg. fish per head per annum is left for human consumption. This is further reduced by manufacturing and other processing so that by the time it is consumed it amounts to only about 5 kg. Total food consumption varies widely in different parts of the world. The Second World Food Survey (FAO, 1952a) shows that, in terms of recent averages at retail level, it was 733 kg. for Sweden, 684 kg. for the United Kingdom, 455 kg. for Venezuela and 252 kg. for India per person per annum. These few examples indicate that fish supplies directly consumed amount to only a fraction of 1 per cent. of the total diet.

For many years FAO, in co-operation with its member governments, has been devoting attention to the preparation of food balance sheets which reveal the composition of national diets and consumption patterns. In November 1952 it published the Second World Food Survey as a progress report. Table 4 is extracted from data presented in this Survey and furnishes an idea of the order of magnitude of fish consumption per head as compared with the consumption of meat, eggs and milk.

In Table 4 the figures under animal protein foods per head include milk, excluding butterfat, but including other milk products in terms of fluid

milk; meat wherever possible is in terms of dressed carcase weight, and fish as fresh landed weight. It will be seen that in the Far East and Africa the animal protein intake is extremely low, and that the contribution that fish makes is small in both regions absolutely and in Africa also as a percentage. Since most fish is consumed near the coasts and rivers, the consumption of the populations living in remote interior regions must be still less.

TABLE 4

GROSS FOOD SUPPLIES IN KG. PER HEAD PER ANNUM OF ANIMAL PROTEIN FOODS * AND FISH, 1946/50, † BY REGIONS

(Computed from FAO, 1952a)

Regions	Animal protein foods	Fish	Fish as percentage of animal protein foods
Far East . . .	34.5	6.6	19.1
Near East . . .	110.2	2.8	2.5
Africa . . .	68.6	2.4	3.5
Latin America . .	141.1	4.9	3.5
Europe . . .	174.7	13.6	7.8
North America and Oceania . . .	502.9	5.2	1.0

* Animal protein foods include meat, fish, milk (as fluid milk) and eggs.

† Extreme limits of the period observed for all regions.

The lack of statistical data in many parts of the world means, of course, that no claim for accuracy can be made for the figures in Table 4, but they are considered to be near enough to illustrate the order of the quantity available and to demonstrate the differences in pattern of consumption.

In calculating basic human dietary requirements, the Second World Food Survey took into account the variation in the needs of people as influenced by climate, energy output in work, sex and age grouping in the units of population considered. It was the aim of this Survey to determine where the deficiencies lay and to indicate where effort in the production of food should be directed. However, in describing the deficiencies and setting the targets, the ultimate ideals of nutritional goals were not used; rather, a point was chosen between what was nutritionally desirable and what it was thought might be feasible in practice.

By using these data and with the most important deficiency, *i.e.*, that of animal protein, in mind, it was calculated that if the total world population increases by 11 per cent. between 1950 and 1960, the percentage increase above recent levels required in gross fish supplies would be 47 per cent., a problem of considerable magnitude.

When this figure of 47 per cent. is examined regionally, it can be broken down as shown in Table 5.

TABLE 5

PERCENTAGE INCREASES REQUIRED IN GROSS SUPPLIES OF FISH TO MEET 1960 TARGETS, AND ESTIMATED PERCENTAGE POPULATION INCREASES BY 1960

(Adapted from FAO, 1952a)

	Fish	Population
Far East	68	10
Near East	50	15
Africa	75	15
Latin America	26	18
Europe	11	8
North America and Oceania	18	14
U.S.S.R.	18	16
World	47	11

The magnitude of these aims is even more clearly revealed when it appears that the greatest increases have to come, as might be expected, in those areas that are least developed economically. So far as the better developed areas are concerned, the opinion is widely held by students of these matters that Europe and North America and Oceania as well as the U.S.S.R. should be fully capable of achieving the aims set forth in the Second World Food Survey by 1960, if indeed they are not already in the position to do so. However, the low purchasing power of most of the consumers in the underdeveloped areas, and the difficulties that face international trade, effectively prevent the use of the productive power of countries in the highly developed areas from making up the shortages in the underdeveloped areas, which are therefore forced to look to improvement in their own production. Another reason for this is to be found in the desire of many countries to be more self-sufficient than they have been in producing their own food. The terrible experience during the second world war of having food imports upon which they were dependent suddenly cut off has engendered this and therefore, even where imported food may be cheaper than that produced locally, there is a tendency to strive for local production.

THE PROSPECT FOR INCREASE IN AQUATIC FOOD

Phytoplankton and Seaweeds

In a recent paper on the contribution of fisheries to world food supplies (FAO, 1953c) it is pointed out that, as on land, the starting point of productivity in the sea is assimilation by plants. Sverdrup (1952) and others believe that the total primary

production of the sea is about equal to that of the land. The comparison is not simple because much food from the land is taken in the plant stage but food from the sea is utilised only to a small degree at this stage of the production chain. That is to say, a much smaller fraction of primary production from the sea is used as human food than from the land.

Assimilation is of course dependent upon the presence of the primary nutrients. Here notice must be taken of the vast accumulation of nutrient materials that lie in the depths of the sea beyond the photosynthetic depths, which as a result of the ocean currents, tides, storms, and temperature changes partly replenish the surface waters. However, there are some reserves which remain undisturbed and unused; these might possibly be brought into use by what may be called artificial upwellings, but the economic and technical aspects of this problem make it something for the remote future. Man's ingenuity might be equal to the task under a sufficient set of compulsions. One might like to speculate on what could be produced by lowering a slow-reacting atomic pile into the depths and allowing mere temperature gradients to accomplish an upwelling, or by harnessing energy to the same end in some other way.

However, to whatever extent the primary production of waters may eventually be increased, it is certain that they could yield considerably more than they do now at the plant stage of the production cycle. Careful surveys have revealed that the quantities of seaweeds taken, although they are considerable, represent only a very small fraction of the measurable stand of weeds. Woodward (1952) estimates that Scotland alone could produce from 70,000 to 110,000 tons of carbohydrates annually from seaweeds. He estimates that 60 million tons of brown seaweed grow on the coasts of Norway, France, the British Isles, Canada and the United States. To compute possible world production would lead to astronomical figures. Beyond this, there are other possibilities for the use of aquatic flora. Weeds from ponds may be used to provide green manure for agricultural land; possible direct or indirect uses may be found for phytoplankton, though it is doubtful whether collecting devices could be made economically feasible.

Zooplankton

Turning to animal life, considerable quantities of small fish, crustaceans and zooplankton are at present used by Asian countries for the manufacture of savoury pastes and sauces (van Veen, 1953). Possibly some use could be made of the immense quantities of zooplankton that inhabit the Antarctic and support the whale populations.

N.A. and R., July 1954

The quantities consumed by whales are enormous (Discovery Reports, 1929; 1935), and though it is unlikely that exploitation of this particular resource could be made economically feasible, the possibility should not be overlooked.

Marine Fish

As far as existing fisheries go, it seems unlikely that the yield need fall below its present level. It is true that certain species in restricted localities such as the North Sea, the halibut of the north-western shores of North America and the whale stocks in the Antarctic are in danger of overfishing and depletion. These fisheries are regulated by international agreement, and this is tending to maintain the present level of production. It is not improbable that under such agreements the economic return from these fisheries will be increased, and that international planning and management will mean greater efficiency.

This is illustrated by a statement of the Ministry of Agriculture and Fisheries (1953b) in London that "Taking three main species—plaice, haddock and cod, the estimate comes out that about half the fishing of the 1930's would give twenty per cent greater weight from the North Sea, over a run of years. Steps in that direction would give gains in proportion: more and better fish with less time spent on catching them." This is in line with the concept of management developed by Graham (1935). His argument is that unplanned fishing not only adversely affects the fish population, which, of course, manifests itself in the catch, but also means an avoidable waste of effort. Redistribution of fishing power would serve to bring the effort nearer to the sustained yielding power of the resources, and would also confer economic advantages on the fleet and liberate effort which could be used on resources that are underdeveloped.

For the most part, fishing is confined to the continental shelves, which together form only 10 per cent. of the marine area (Kask, 1951), but there are indications that fishing in other regions for pelagic species is on the increase, particularly for such species as tuna and herring-like fish. New methods of fish detection and new knowledge about fish behaviour are making it increasingly possible to add to the catches of these species. There is some indication that the fluctuations in production are in large part due to economic factors, and that output could be increased if these could be controlled (FAO, 1949). In other cases fluctuations in yield seem to be due to natural causes, as, for example, with the Californian sardine (Clark and Daugherty, 1950; California Department of Fish and Game, Marine Research Committee, 1952), the Atlantic sardine (Furnestin, 1952) and the Indian

oil sardine (Nair and Chidambaram, 1951), though with the last, inefficiency of the existing gear also plays a part. At present it is believed that the stocks of fish in several parts of the world are underexploited. Among these are the Arabian Sea and the Persian Gulf for anchovy and similar species (Blegvad and Løppenthin, 1944), and the southern waters off Australia and the west coast of South America, and the English Channel, for pilchards (Fiedler *et al.*, 1943; Blackburn, 1951; Ministry of Agriculture and Fisheries, 1953a). While the exploitation of these stocks would undoubtedly vary in yield and regularity, it is certain that additional yields could be obtained of the order of many thousands of tons per annum. An example of this is the pilchard fishery off South Africa, which in eight years has risen from nothing to 400,000 tons a year, and is thought to be capable of still further expansion (Gertenbach, 1953). Then again, with reference to flat fish, Walford (1951) maintains that only 10 per cent of the known plaice grounds are being fished, an estimate which holds possibilities of important increases. It may be assumed that similar prospects exist for other species of this group. Sharks and other elasmobranchs offer possibilities, especially in neglected areas such as the Red Sea (Marshall, 1952).

Crustaceans and Molluscs

Crustaceans and molluscs constitute another part of the total aquatic resources that are now being more extensively exploited and hold possibilities of further expansion. During the last few years new stocks of crustaceans have been located and have given rise to new fisheries off the American east coast (Walford, 1948; Anderson *et al.*, 1950), off the east coast of Australia (Commonwealth Director of Fisheries, Australia, 1950a) and in the Gulf of Mexico (Springer and Bullis, 1952). Crayfish have been exploited in South Africa (Gertenbach, 1953) and Western Australia (Sheard, 1949; Commonwealth Director of Fisheries, Australia, 1950b). Other obvious places for increased exploitations are in the Bay of Bengal, off the mouths of the Ganges and Godavari rivers. The Indus and the mouths of rivers of New Guinea and Borneo would offer similar opportunities.

Thus for the sea fisheries we see that although among the existing fisheries there are some that would not produce substantially more but in which, nevertheless, greater efficiency and economy of effort could be obtained, there are others that could yield more and are underexploited, and still others that are neglected. Certain resources such as the phyto- and zoo-plankton may be further developed.

Freshwater Fish : Fish Culture

Inland waters constitute another section of the aquatic resources in which increased production will certainly take place. It is estimated that 4-6 million tons of freshwater fish are taken annually. This includes substantial fishing of the wild stocks in the lakes and rivers of the Asian continent (including China) and Latin America; the commercial fishery of the Great Lakes of North America; rivers and lakes in British East Africa, Europe, China and Cambodia; and the cultural operations in fresh and brackish waters of China, India, Japan, Taiwan, the Philippines and Indonesia. Fish culture has undoubtedly existed for many hundreds of years in parts of Asia, and the arts of it were passed down from father to son or from master to apprentice. But it was an art rather than a science; the techniques were perfected in relation to a certain set of conditions, laboriously worked out by a process of trial and error that must have lasted for centuries. Little, if anything, was known of the reasons why things worked; it was sufficient that they did. Thus, when it came to transferring the knowledge to a new set of conditions, difficulties and failures were encountered. Of recent years scientists have intensified their study of the basic principles involved and a scientific basis for the art of fish culture is being worked out. It is becoming increasingly possible to work in new conditions and to bring into use waters that once lay idle and unmanaged. The great reservoirs and canal systems required by irrigation, the swampy areas, the salt marshes unfit for agricultural production, can all be put into use as producers of fish. For the Indo-Pacific region alone it is estimated that there are 37 million hectares (FAO, 1952b) of cultivable inland waters. If all this were put into use and even a very modest average yield were achieved, a substantial total would result.

Fish culture in inland water systems has many advantages for the economically underdeveloped areas. The problems of transport, preservation and complex marketing systems are reduced to a minimum. The fish may be reared where it is needed and harvested at the moment it is required. Under special conditions which prevail in such places as Haiti, where there were no predator fish amongst the relatively sparse fauna of the inland water systems, the rough release of fry reared in recently established breeding ponds under the guidance of FAO has led to a great increase in fish population and of production by the peasant farmers. The whole of Central America could undoubtedly add to its indigenously produced animal protein by fish culture operations. Similar results have been produced in Thailand. A notable yield of freshwater fish is obtained by

cultivation in wet rice paddies, and it is reported that not only is a protein crop obtained, but the yield of rice is increased by about 7 per cent (Schuster, 1954). Much more work of this type could be done in India, Egypt, Burma and elsewhere.

Thus, taking into account the possibilities of further exploitation in the sea, and remembering that the fresh and brackish waters of the world could produce much more, there seems to be no reason, from the biological point of view, why fisheries should not yield much more food than they do at present.

The technical ability of man to take advantage of what is biologically possible is also advancing. The use of echo sounding and of asdic for fish finding is widely practised and new refinements are constantly being added. Studies of the behaviour of a fish, its reactions to environment and its migratory habits are making it increasingly possible to predict its presence. A fuller understanding of how fishing gear works and the design of new fish-catching apparatus are improving the chances of catching it once it is found. The use of under-water electric fields to control the movements of fish, to fence them in, so to speak, is already being tried with some hope of success (Tester, 1952; Meyer, 1953). In many of the economically underdeveloped countries fishermen are changing from sail to mechanical propulsion. This not only enables them to tap hitherto unused resources, but reduces the weather hazard because they are able to accomplish their task more rapidly.

Advances are being made in fish handling also. Much work is being undertaken on better methods of fish preservation, and it is becoming increasingly possible to reduce waste from spoilage of this most perishable food product. Fish that were previously unmarketable are now presented to the consumer in different, acceptable forms. In the United States a whole new industry was created in New England by the successful marketing of skinned fillets of rose fish, a fish which was unacceptable in a merely "dressed" state. The landings increased from 120 tons in 1932 to over 94,000 tons in 1950. In other instances, improvements in freezing and transport have widened markets. A newer development is to be found in the marketing of fish pre-cooked. Two-ounce portions of fresh fish are breaded and fried, and then rapidly frozen. Subsequent warming is all that is necessary to produce an appetising dish.

At the opposite end of the scale, experiments in the manufacture of dehydrated fish protein in the form of "fish flour" have indicated that this substance may be incorporated in bread without

any adverse reaction from the consumer. If this can be made commercially feasible, a relatively cheap and convenient way will have been found to raise the animal protein intake and enrich an otherwise predominantly carbohydrate diet. The acceptability of commercially produced fishmeal added to rice and other high-carbohydrate diets, such as are prevalent in Asia, is also being tested, with promising results. If such measures are successful, a good many problems connected with transport and storage will be made easier and the reduced costs should result in prices within the means of more people.

Efforts are also being directed towards the improvement of marketing and distribution, and though much in this direction remains to be done even in the most advanced countries, increasing attention is being paid to the problems involved.

And so it seems that technologically as well as biologically there is no reason why the supply of fish as food should not be greatly increased. In the United States the catch has steadily risen from an average of 1.4 million tons in 1930-34 to 2.2 million tons in 1950 and no physical reason is foreseen why further increases of this proportion could not take place in future. Again, the U.S.S.R. (Department of Fisheries, Canada, 1953) in the current Five Year Plan hopes to raise the catch to more than twice that of 1950. The Japanese Fisheries Agency has predicted that Japan's production of fish will reach 5 million tons in 1957 (Neville, 1953).

It will be noted that these countries are in the forefront of technical and economic development, and it would not be safe to conclude that the less developed countries, where the biggest needs lie, will achieve increases of this order. Nor would it be safe to take for granted that what is physically possible in increased production, will actually take place in these better developed countries. Fisheries products are particularly vulnerable to competition from other foods and the demand for most of them shows considerable elasticity. Then again, production in the better developed parts of the world is considerably influenced by the opportunities of international trade, and protective policies, currency difficulties and similar impediments may operate to restrict production.

In the underdeveloped countries, the strategic importance of fisheries products in the diet may cause the adoption of policies that are quite different from those in the better developed. Here it must be remembered that the supply of animal protein from agricultural sources is extremely limited. The relation of the area of arable land to the population density precludes the use of

pasture and the feeding of animals on cereals, but the production of fish does not encroach on the growth of cereals or vegetable food products. On the other hand, the lack of modern skills and of the capital apparatus which they require constitutes a barrier to development that can usually be overcome only by special intervention of governments.

It is here that the Food and Agriculture Organization can be of assistance. It assists governments to assess local resources and determine the possibilities for their development, it helps to put into motion a set of incentives which can operate through some form of organised structure which will get production under way, and it aids in the achievement of methods of distribution and consumption suited to the prevailing conditions.

However, fisheries problems cannot be dealt with in isolation and apart from the general level of economy. Any increase in consumption of animal protein which fisheries could supply, by people who are really in need of it will, to a large measure, depend upon a general heightening of effective economic activity such as is the aim of all programmes of technical assistance.

The Final Act of the Hot Springs Conference (United Nations Conference on Food and Agriculture, 1943) opens with a Declaration, from which paragraphs 3 and 4 are quoted:

"There has never been enough food for the health of all people. This is justified neither by ignorance nor by the harshness of nature. Production of food must be greatly expanded; we now have knowledge of the means by which this can be done. It requires imagination and firm will on the part of each government and people to make use of that knowledge.

"The first cause of hunger and malnutrition is poverty. It is useless to produce more food unless men and nations provide the markets to absorb it. There must be an expansion of the whole world economy to provide the purchasing power sufficient to maintain an adequate diet for all. With full employment in all countries, enlarged industrial production, the absence of exploitation, an increasing flow of trade within and between countries, an orderly management of domestic and international investment and currencies, and sustained internal and international economic equilibrium, the food which is produced can be made available to all people."

This statement is just as true today as it was when it was made in 1943. It is particularly true of fisheries and the contribution they could make to world food supplies.

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1. TECHNIQUE

CHEMICAL

APPARATUS

2691

FAJKOŠ, L. Automatizace chromatografických prací. [Automatic chromatographic procedures.] *Chem. listy*, 1953, **47**, 630-631. [Inst. Organ. Chem., Czech. Acad. Sci., Prague.]

The construction of a new apparatus for automatic chromatographic procedures is described. The apparatus consists of a rotating disc, with receiving vessels and siphon, for collecting consecutive fractions of eluate.—A. Jančařík (Czechoslovakia).

2692

WUNDERLY, C. A trough for paper chromatography consisting of segments. *Nature*, 1954, **173**, 267-268. [Med. Clin., Univ. Zürich.]

The trough described makes it possible to perform separations under identical conditions. Examples of its use include the study of the effect of variations in pH and ionic strength on the movement of various compounds.—H. G. Bray.

2693

MITCHELL, L. C. A tank for 8 × 8 inch paper chromatograms. *J. Assoc. Off. Agric. Chem.*, 1953, **36**, 1187-1188. [Dept. Health, Education and Welfare, Washington 25, D.C.]

Details of construction are given, the 8 × 8 in. size having been chosen because the time for development with many mobile solvent systems is within a range of 1 to 4 hr. and on such a sheet 7 or 8 samples can be spotted, without crowding, for one-dimensional development.—D. Harvey.

2694

POLSON, A. An electrophoresis cell for analysing four samples simultaneously. *Biochem. biophys. Acta*, 1954, **13**, 451-452. [Virus Res. Unit, Dept. Pathol., Univ. Cape Town.]

2695

CANNON, J. R. and GILSON, A. R. A simple apparatus and technique for preparative paper electrophoresis. *Chem. and Indust.*, 1954, No. 5, 120-121. [Univ. Chem. Lab., Pembroke St., Cambridge.]

A variation of the type of apparatus used for descending paper chromatography. The apparatus and procedure are described in detail.

H. G. Bray.

2696

PODROUŽEK, V. Jednoduché zařízení k hodnocení papírových elektroferogramů. [A simplified

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apparatus for evaluation of paper electropherograms.] *Čsl. Fysiol.*, 1953, 312-314.

A simplified photometric apparatus for evaluation of paper electropherograms is described.

A. Jančařík (Czechoslovakia).

2697

BRADA, M. and BRADA, Z. Zařízení ke kvantitativní mikrospektrografii. [A new apparatus for quantitative microspectrography.] *Čsl. Fysiol.*, 1953, 433-438. [Dept. Biochem., Masaryk's Radiotherap. Inst., Brno.]

With the exception of the source of monochromatic light, which may be replaced by suitable light-filters, only easily obtainable parts were used for the construction. Novák's sensitometer was used for the final measurements. The results obtained are in good agreement with those obtained by other methods.—A. Jančařík (Czechoslovakia).

See also Abst. 2726.

ANALYTICAL METHODS

General

2698

IRREVERRE, F. and MARTIN, W. Versatile technique of paper chromatography. *Anal. Chem.*, 1954, **26**, 257-260. [Nat. Inst. Arthritis and Metabol. Dis., Bethesda, Md.]

The rate of solvent flow in descending paper chromatography can be varied over a wide range by means of a system of "wicks", which is described.—H. G. Bray.

2699

SCHWERDTFEGGER, E. Modifizierte eindimensionale Papierchromatographie für quantitative Zwecke. [Modified one-dimensional paper chromatography for quantitative work.] *Naturwissenschaften*, 1954, **41**, 18. [Oskar-Kellner-Inst. Tierernährung, Rostock.]

A technique is described in which the paper sheet is cut so that the spots of the samples to be treated are applied at points situated on "bridges" between the main body of the paper and the horizontal strip which is immersed in the developing solvent when applying descending chromatography. Mixtures which give continuous streaks when the usual procedure is applied give bands.

H. G. Bray.

2700

MATTHIAS, W. Serienuntersuchungen mit Hilfe einer neuen Form der Streifen-Papierchromatographie. [Serial experiments with a new type

of paper strip chromatography.] *Naturwissenschaften*, 1954, **41**, 17-18. [Inst. Pflanzenzücht. Quedlinburg, Deutsch. Akad. Landwirtsch., Berlin.]

A sheet of paper is cut so that there are at the lower end pointed projections equal in number to the number of samples to be investigated. The samples are applied to the points and the chromatogram is developed by an ascending technique. The bands from each sample behave independently and their size and intensities are readily compared.

H. G. Bray.

2701

DICASTRO, G. **Some remarks on two-dimensional paper electrophoresis.** *Experientia*, 1954, **10**, 27-28. ["Medital" Labs. Res. Div., Rome.] Italian summary.

A detailed description of a technique.

H. G. Bray.

2702

DVOŘÁK, J., GRUBNER, O. and ŠPURNÝ, Z. Protid-proudová kontinuální elektroforesa na papíře. Předběžné sdělení. [Counterstream continuous electrophoresis on filter paper. A preliminary communication.] *Chem. listy*, 1953, **47**, 899-900. [Physik.-Chem. Inst., Karl's Univ., Prague.]

A new method for electrophoresis, based on the fact that the particles, charged with electricity, are drawn by the electric current against the stream of an electrolyte flowing down a plane, the inclination of which can be varied.

M. Prokšová (Czechoslovakia).

Carbohydrate Constituents

2703

GAILLARD, B. D. E. De papierchromatografie van suikers. [Paper chromatography of sugars.] *Pharm. Weekblad*, 1953, **88**, 629-641. [Lab. Physiol. Dieren, Landbouwhogeschool, Wageningen.]

A detailed working account is given of the chromatography and electrophoresis of sugars on paper.—I. Leitch.

2704

BARKER, G. R. and SMITH, D. C. C. **Paper chromatography of some carbohydrates and related compounds in the presence of boric acid.** *Chem. and Indust.*, 1954, No. 1, 19-20. [Dept. Chem., Univ. Manchester.]

2705

GIRI, K. V. and NIGAM, V. N. **Circular paper chromatography. 8. Separation, identification and quantitative estimation of sugars and oligosaccharides.** *J. Indian Inst. Sci. [A]*, 1954, **36**, 49-63. [Dept. Biochem., Indian Inst. Sci., Bangalore 3.]

The most suitable solvent mixtures were found to be *n*-butanol : pyridine : water (60 : 40 : 30) and *n*-butanol : acetone : water (20 : 70 : 10). A method is described for estimating sugars on paper, based on the reduction of triphenyltetra-azolum chloride in alkaline solution to form an insoluble red formazan.—H. G. Bray.

2706

KILGOUR, G. L. and DUTTON, G. G. S. **The photographic recording of paper chromatograms of carbohydrates and a new spray reagent.** *Canad. J. Chem.*, 1953, **31**, 1260-1261. [Dept. Chem., Univ. British Columbia, Vancouver 8.]

The coloured spots obtained on spraying paper chromatograms of sugars with different reagents absorb ultraviolet light. This property can be used in making photographic records of paper chromatograms. The most suitable spraying reagents are aniline hydrogen malonate for pentoses and hexoses and aniline trichloroacetate for uronic acids.—H. G. Bray.

2707

HARRIS, G. and MACWILLIAM, I. C. **A dipping technique for revealing sugars on paper chromatograms.** *Chem. and Indust.*, 1954, No. 9, 249. [Brewing Indust. Res. Found., Nutfield, Surrey.]

Modified benzidine-trichloroacetic acid, naphthoresorcinol-phosphoric acid and diphenylamine-aniline-phosphoric acid reagents are described for the detection of sugars on paper chromatograms, with a dipping technique instead of spraying.

H. G. Bray.

2708

BARNES, H. D. and BLOOMBERG, B. M. **Paper chromatography of the urinary sugar in essential pentosuria.** *S. African J. Med. Sci.*, 1953, **18**, 93-98. [Biochem. Dept., S. African Inst. Med. Res., Johannesburg.]

2709

HONER, C. J. and TUCKEY, S. L. **A method for determination of lactose in milk by paper chromatography.** *J. Dairy Sci.*, 1953, **36**, 1233-1240. [Dept. Food Technol., Univ. Illinois, Urbana.]

Diluted milk is applied directly to filter paper (Whatman No. 1) and subjected to descending chromatography, with a mixture of ethyl acetate, pyridine and water (2.5 : 1 : 3.5) as solvent. Two spots are run simultaneously on the same strip. After 24 hours' development the strip is dried and cut lengthwise. On one half the sugars are located by means of AgNO₃ in acetone. The other half is cut lengthwise into 6 strips and in each the lactose is located by reference to the treated strip. The zones judged to contain

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lactose are cut into segments and each is treated in a boiling-water bath with potassium ferricyanide, sodium carbonate and potassium cyanide. Ferric sulphate and gum arabic are then added and the colours produced are read in a spectrophotometer. In control experiments where lactose was added to milk the average recovery was 95, range 92 to 97 per cent.—H. G. Bray.

2710

SKELL, P. S. and CRIST, J. G. **A rapid gasometric method of analysis for "reducing" sugars and other carbonyl compounds.** *Nature*, 1954, **173**, 401. [Dept. Chem., Pennsylvania State Univ.]

2711

WAGER, H. G. **An improved copper reduction method for the micro-determination of reducing sugars.** *Analyst*, 1954, **79**, 34-38. [Low Temp. Res. Stat., Univ. Cambridge.]

Errors in the Nelson method (Abst. 849, Vol. 14) were shown to be due to oxidation reactions brought about by atmospheric oxygen and to the instability of the blue colour finally formed. Modifications are suggested, including the use of an oxygen-free atmosphere and the measurement of the extinction coefficient of the final solution after a standard time. An apparatus is described for heating and cooling the reaction mixture under nitrogen.—H. G. Bray.

2712

LANDGREBE, F. W. and MUNDAY, K. A. **A modified Folin-Malmros technique for the estimation of blood sugar, particularly suitable for low values or for micro work.** *Quart. J. Exp. Physiol.*, 1954, **39**, 17-22. [Dept. Materia Med., Welsh Nat. Sch. Med.]

Blood proteins are precipitated by dilute tungstic acid and the supernatant is treated with ferricyanide and alkaline cyanide. The ferrocyanide produced by reduction is converted by means of ferric chloride to Prussian blue, which is estimated colorimetrically. By the procedure described 12 samples can be dealt with in 45 min. Normal concentrations of blood glucose can be estimated within 2 per cent. and 2 to 3 μ g. to within 5 per cent. As little as 0.01 ml. blood may be used.—H. G. Bray.

2713

BADIN, J., JACKSON, C. and SCHUBERT, M. **Improved method for determination of plasma polysaccharides with tryptophan.** *Proc. Soc. Exp. Biol. Med.*, 1953, **84**, 288-291. [Dept. Chem., Coll. Med., Univ. New York.]

The polysaccharide is treated with a mixture of boric and sulphuric acids and, after cooling, trypto-

phan is added. The mixture is heated in a boiling-water bath and the violet colour produced is measured photometrically.—H. G. Bray.

2714

GRANDE, F., UTRERA, A. and DE OYA, J. C. **La reaccion de la antrona en la determinacion de los hidratos de carbono. [The anthrone reaction in the estimation of carbohydrates.]** *Rev. clin. española*, 1953, **51**, 17-23. [Inst. Invest. Med., Madrid.] English, German and French summaries.

The reaction of anthrone with carbohydrates was studied, with particular attention to the precautions necessary in applying the reaction to the quantitative estimation of carbohydrates. The application of the anthrone method to the estimation of glycogen in biological tissues is fully described. The results obtained agree closely with those obtained by the classic method of Good, Kramer and Somogyi. With regard to the mechanism of the reaction, the available data indicate that it is produced by the condensation of anthranol with methyl- or hydroxymethylfurfural. The method is useful in biochemical analysis not only for glycogen estimation, but in blood sugar estimations, since it is not affected by the presence of reducing substances other than sugars which interfere in other methods.—M. B. Richards.

2715

WALLENUS, G. **Some procedures for dextran estimation in various body fluids.** *Acta Soc. Med. upsalien.*, 1953, **59**, 69-77. [Central Lab., Univ. Hosp., Upsala.]

Procedures for the estimation of dextran are outlined. For low concentrations the anthrone method is considered most satisfactory, and full details are given of a modified procedure used for the analysis of serum, ascites or similar body fluids. For the specific detection of dextran a serological method is described which can be used for the semi-quantitative estimation of small amounts.—M. B. Richards.

2716

KAHAN, J. **A rapid photometric method for the determination of glycogen.** *Arch. Biochem. Biophys.*, 1953, **47**, 408-418. [Pharmacol. Dept., Karolinska Inst., Fac. Med., Stockholm 60, Sweden.]

A trichloroacetic acid extract of the tissue is treated with baryta to remove interfering substances, excess Ba is precipitated with zinc sulphate and the clear supernatant is treated with an H_2SO_4 -anthrone reagent, and the colour formed is estimated photometrically. From 2 to 300 μ g. glycogen can be estimated to within ± 2.6 per cent.—H. G. Bray.

2717

HERBAIN, M. Le microdosage du glycogène hépatique. Son application aux prélèvements biopsiques. [Micro-estimation of liver glycogen. Its application to biopsy samples.] *Bull. Soc. Chim. biol.*, 1953, **35**, 1421-1436. [Lab. Pathol. Exp., Fac. Méd., Paris.]

Two procedures are described, one applicable to 15 to 20 mg. tissue and the other to 3 to 4 mg. In the first glycogen is isolated by ethanolic precipitation and hydrolysed and the glucose formed is estimated colorimetrically by a Prussian blue reaction. In the second method the glycogen:nitrogen ratio of the sample is estimated and from this the glycogen content of the whole liver is deduced.—H. G. Bray.

2718

D'ARCY, R. A. A routine method for estimating the starch content of wheat by-products. *Cereal Chem.*, 1954, **31**, 37-42. [Dublin Port Milling Co., Ltd., Ireland.]

Soluble carbohydrates are removed by 2 per cent. HCl and the residue is hydrolysed. The reducing power of the hydrolysate is then estimated before and after fermentation by yeast.

H. G. Bray.

2719

MACDOUGALL, D. The determination of lignin in plant tissues: use of a continuous-extraction method to remove interfering materials. *J. Sci. Food Agric.*, 1954, **5**, 103-107. [Dept. Chem., Ontario Agric. Coll., Guelph, Ont.]

The removal of contaminating carbohydrate and nitrogenous fractions of plant material was accomplished by 6-hr. continuous extraction in a Soxhlet extractor with 1 per cent. HCl. The isolated lignin contained less N and had a lower methoxyl content than that isolated by the standard A.O.A.C. pre-treatment.—D. M. Walker.

Nitrogenous Constituents

2720

BRADSTREET, R. B. Kjeldahl method for organic nitrogen. *Anal. Chem.*, 1954, **26**, 185-187. [Bradstreet Labs., Inc., 1356 North Broad St., Hillside, N.J.]

A critical review.

2721

BRADSTREET, R. B. Determination of nitro nitrogen by the Kjeldahl method. *Anal. Chem.*, 1954, **26**, 235-236. [Bradstreet Labs., Inc., 1356 North Broad St., Hillside, N.J.]

It was found that a mixture of concentrated H_2SO_4 , 35 ml., and a mixture of equal parts of α -naphthol and pyrogallol, 1 g., was the most satisfactory of several studied for the preliminary

treatment of nitro-compounds. For the digestion K_2SO_4 , 18 g., and a mixture of $FeSO_4$ and Se as a catalyst were used.—H. G. Bray.

2722

SHORT, E. I. The estimation of total nitrogen using the Conway micro-diffusion cell. *J. Clin. Pathol.*, 1954, **7**, 81-83. [Wellcome Res. Labs., Biol. Div., Beckenham, Kent.]

An adaptation of the original method, employing the reagents used for blood urea estimations. Results obtained in control experiments with serum and urine are given, showing the overall mean recovery to be between 98.8 and 101.2 per cent.—H. G. Bray.

2723

PARKS, T. D., BASTIN, E. L., AGAZZI, E. J. and BROOKS, F. R. Improved micro-Dumas method and apparatus. *Anal. Chem.*, 1954, **26**, 229-232. [Shell Development Co., Emeryville, Calif.]

The sample is vaporised in a stream of CO_2 and organic gases are oxidised by passage over nickel oxide at 1000° , CO by passage over hopcalite at 110° and traces of methane by passage over active copper oxide at 700° C. The incompletely oxidised residue is finally oxidised by oxygen. The nitrogen liberated is collected over KOH in an azotometer and its volume measured by weighing an equal volume of mercury displaced. The apparatus required is described. In examples given the deviations from the theoretical value were, in general, less than 1 per cent. of the actual value.—H. G. Bray.

2724

BERKMAN, S., HENRY, R. J., GOLUB, O. J. and SEGALOVE, M. Tungstic acid precipitation of blood proteins. *J. Biol. Chem.*, 1954, **206**, 937-943. [Bio-Sci. Labs., Beverly Hills, Calif.]

2725

RUTSTEIN, D. D., INGENITO, E. F. and REYNOLDS, W. E. (with BURKE, J. M.) The determination of albumin in human blood plasma and serum. A method based on the interaction of albumin with an anionic dye—2-(4'-hydroxybenzeneazo) benzoic acid. *J. Clin. Invest.*, 1954, **33**, 211-221. [Dept. Prevent. Med., Med. Sch., Harvard Univ., Boston, Mass.]

2726

CROOK, E. M., HARRIS, H., HASSAN, F. and WARREN, F. L. Continuous direct photometry of dyed materials in filter paper with special reference to the estimation of proteins separated by electrophoresis. *Biochem. J.*,

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1954, **56**, 434-444. [Dept. Biochem., University Coll., London.]

An apparatus and a procedure are described. It was found that Beer's law applies to the absorption of light by dyed proteins only over a narrow range, but deviations can be corrected for. The validity of the results of electrophoretic analysis of protein solutions is considered.—H. G. Bray.

2727

KUTZIM, H. Die Elektrophorese eiweissarmer Flüssigkeiten nach Ultrafiltration durch Hülssen aus Kollodiumwolle. [Electrophoresis of fluids of low protein content after ultrafiltration through membranes of collodion wool.] *Deutsch. med. Wochenschr.*, 1954, **79**, 168-170. [Hautklin., Univ. Cologne.]

A procedure is described for the preparation of membranes from collodion wool (preferably HP 5000) for the ultrafiltration of low-protein solutions under reduced pressure. The application of the method to the concentration and electrophoretic separation of solutions of low protein content is illustrated for a diluted serum, cerebrospinal fluid, a protein-containing urine, and the fluid from a cantharides blister.—M. B. Richards.

2728

KUTÁČEK, M. and KOLOUŠEK, J. Elektroforesa na papíře ve službách zemědělské biochemie 1. Dělení a kvantitativní vyhodnocování serových bílkovin hospodářských zvířat. [Electrophoresis on filter paper in agricultural biochemistry 1. Separation and quantitative evaluation of the serum proteins of domestic animals.] *Sborn. čsl. Akad. Zéměd.*, 1953, **26**, 575-586. [Agrobiocem. Lab., Vysoké Školy Zéměd., Prague.] Russian and English summaries.

A simplified method for the electrophoresis of proteins on filter paper is described. The apparatus contains an automatic scanner for the quantitative evaluation of the results. With bovine and horse serum the results obtained agreed closely with those given by the standard Tiselius apparatus. With horse serum evidence was obtained of a fraction which travelled towards the anode in front of the albumin fraction. (From summary.)

W. Godden.

2729

GRASSMANN, W. and DEFFNER, G. Verteilungs-chromatographisches Verhalten von Proteinen und Peptiden in phenolhaltigen Lösungsmitteln. [Partition-chromatographic behaviour of proteins and peptides in solvents containing phenol.] *Hoppe-Seyler's Ztschr.*, 1953, **293**, 89-98. [Forschungsstelle Eiweiss, Max-Planck-Gesellsch., Regensburg.]

The chromatographic behaviour of proteins in

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phenol-containing solvent mixtures is discussed and values are given for the partition coefficients of several proteins between phenol and water and between *n*-butanol and water. R_F values are given for several amino-acids and di- and tri-peptides in mixtures of phenol, *n*-butanol and acetic acid.—H. G. Bray.

2730

PANDOLFI, C. Un rapido metodo di dosaggio delle proteine nel latte. [A quick method of estimating proteins in milk.] *Boll. Soc. ital. Biol. sper.*, 1953, **29**, 1207-1208. [Lab. Municip. Controllo, Centrale del Latte, Naples.]

2731

SLOTTA, K. and PRIMOSIGH, J. A new method of quantitative paper chromatography. *Mem. Inst. Butantan*, 1952, **24**, 85-100. [Res. Dept., Ind. Farm. Endochímica, São Paulo, Brazil.]

The method as modified is intended for separating amino-acids in protein hydrolysates.

E. M. Hume.

2732

PFENNIG, N. Günstige Lösungsmittelkombination für zweidimensionale Papierchromatographie von Aminosäuren. [Suitable solvent mixtures for two-dimensional paper chromatography of amino-acids.] *Naturwissenschaften*, 1954, **41**, 62-63. [Inst. Microbiol., Univ. Göttingen.]

The solvents found to be most useful were butanol:glacial acetic acid:water (40:10:50) followed by α -picoline:pyridine:water (72:5:23) or α -picoline:glacial acetic acid:water (75:2:23).

H. G. Bray.

2733

SAIFER, A. and ORESKES, I. Circular paper chromatography. 2. Isatin as a colour reagent for amino acids. *Science*, 1954, **119**, 124-125. [Biochem. Dept., Div. Labs., Jewish Sanit., Brooklyn, N.Y.]

The dried developed chromatogram is dipped in a solution of isatin, 0.2 per cent. in acetone containing 4 per cent. acetic acid, dried in air and then heated at 100°C. for 10 min. Under these conditions 12 of 21 common amino-acids give colours described as blue (proline, histidine, aspartic acid), blue-green (phenylalanine, tyrosine, tryptophan, hydroxyproline), lavender (glutamic acid, lysine, arginine) and blue-grey (cystine). The particular usefulness of this reagent in circular paper chromatography lies in the fact that of the amino-acids that travel in pairs in some solvents (tyrosine and alanine, valine and methionine) only one of each pair gives a colour.—H. G. Bray.

2734

CURZON, G. and GILTROW, J. **Aromatic aldehydes as specific chromatographic colour reagents for amino-acids.** *Nature*, 1954, **173**, 314-315. [Dept. Biochem., Inst. Orthopaedics, Brockley Hill, Stanmore, Middlesex.]

Dried chromatograms were dipped in acetone or *n*-butanol solutions of aldehydes and heated, and the appearance of spots was recorded in daylight or ultraviolet light. Vanillin gave a red colour with ornithine and amino-acids after the chromatogram was dipped in 1 per cent. ethanolic KOH. *o*-Phthalaldehyde gave a green or purple spot with glycine, according as urea was present in the developing solvent or not, and coloured spots in ultraviolet light with glutamic acid, taurine, histidine, tryptophan and tryptamine. Terephthalaldehyde in acetone solution was found to be a specific reagent for histidine, tryptophan and tryptamine, giving spots of different colours, visible in ultraviolet light.—H. G. Bray.

2735

SMITH, D. C. and TOMPSETT, S. L. **The quantitative determination of amino-acids in urine used in conjunction with one-dimensional paper chromatography.** *J. Clin. Pathol.*, 1954, **7**, 79-80. [Biochem. Lab., Northern Gen. Hosp., Edinburgh.]

One-dimensional paper chromatograms are cut horizontally into 10 equal strips and the amino-acids in each are estimated by a ninhydrin method. H. G. Bray.

2736

CHEBOTAREV, A. **[Estimation of amino-acid pattern of casein and albumin by paper chromatography.]** *Mol. Prom.*, 1953, **14**, No. 9, 36.

2737

SCHLÖGL, K. and WAWERSICH, E. **Eine Methode zur gleichzeitigen Bestimmung der amino- und carboxylendständigen Aminosäure in Peptiden. [A method for the simultaneous estimation of terminal amino and carboxyl amino-acids in peptides.]** *Naturwissenschaften*, 1954, **41**, 38-39. [Chem. Lab., Univ. Vienna.]

An *N*-carbobenzoxytripeptide is heated at 100° C. for 4 to 6 hr. with hydrazine hydrate to give the hydrazide of the central amino-acid and the dihydrazide of the terminal NH₂ amino-acid, the terminal COOH amino-acid being unsubstituted. One portion of the reaction mixture is treated with benzaldehyde or acetone in order to estimate the unsubstituted acid. Another portion is heated in water for 10 to 20 min., whereupon the dihydrazide undergoes ring closure and the triazine or amino-hydantoin formed is extracted with ether from the acidified reaction mixture and estimated chromatographically.—H. G. Bray.

2738

GRASSMANN, W., HÖRMANN, H. and ENDRES, H. **Eine Verbesserung der Bestimmung von Aminosäuren am Carboxylende von Peptiden durch Reduktion der Carboxylgruppe. [An improvement in the estimation of terminal carboxyl amino-acids of peptides by reduction of the carboxyl group.]** *Chem. Ber.*, 1953, **86**, 1477-1482. [Max-Planck-Gesellschaft., Regensburg.]

The terminal carboxyl groups of the peptides are esterified and reduced with LiBH₄. The product is hydrolysed with dilute HCl and the resulting amino-acids and amino-alcohols are converted to their dinitrophenyl derivatives. The dinitrophenylamino-alcohols can be separated quantitatively from the amino-acid derivatives by paper chromatography and identified.

W. Godden.

2739

KOLTHOFF, I. M., STRICKS, W. and MORREN, L. **Amperometric mercurimetric titration of sulphydryl groups in biologically important substances at the rotated platinum wire electrode as indicator electrode.** *Anal. Chem.*, 1954, **26**, 366-372. [Sch. Chem., Univ. Minnesota, Minneapolis 14.]

The method is based on the reaction of mercuric mercury with —SH compounds, a rotating platinum wire being used as indicator electrode. The procedures described are applicable to from 7 to 50 µg. —SH in aqueous solutions of biological materials, the accuracy being within 2 per cent. The method is applicable to serum proteins.

H. G. Bray.

2740

BERNÁ-NOVOTNÁ, B. **Kolorimetrické mikroučření alfa-aminodusíku v biologických tekutinách použitím měďnatých komplexů. [Colorimetric microestimation of α-amino-nitrogen in biological fluids with copper complexes.]** *Lékařské listy*, 1954, **9**, 25-27. [Inst. Med. Chem., Masaryk's Univ., Brno.] English, French and Russian summaries.

A new modification of the colorimetric estimation of amino-acids in biological fluids by means of copper complexes (by using the protective colloid) is described.—M. Prokšová (Czechoslovakia).

2741

CAMIEN, M. N. and DUNN, M. S. **Ultra-micro-determination of arginine by a compound microbiological assay method.** *Proc. Soc. Exp. Biol. Med.*, 1954, **85**, 177-183. [Chem. Lab., Univ. California, Los Angeles.]

The D-lactic acid produced by *Lactobacillus casei* in media containing arginine is estimated in terms of the L-lactic acid produced from it by *Lactobacillus casei* 280-16 when grown on the

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culture medium from the first incubation. This method is claimed to be about 144 times as sensitive as standard one-stage microbiological methods. Full experimental details are given.—H. G. Bray.

2742

FEARON, W. R. and BOGGUST, W. A. **The detection of serine and threonine by the 1:2-dinitrobenzene-enediol reaction.** *Analyst*, 1954, **79**, 101-102. [Dept. Biochem., Trinity Coll., Dublin.]

Serine and threonine give a violet colour with 1:2-dinitrobenzene, 0.02 per cent. in water, and sodium hypochlorite, 1 per cent. in alkaline solution. Concentrations of 1 in 5000 may be detected. The test is not given by a large number of amino acids and similar compounds. The scope of the test and the course of the reaction are discussed.

H. G. Bray.

2743

SCANU, A. Curve di frazionamento delle proteine sieriche con il metodo dell'iposolfito sodico. 1. Sieri umani normali. **[Fractionation curves of serum proteins by the sodium hyposulphite method. 1. Normal human sera.]** *Riv. Ist. sieroterap. ital.*, 1953, **28**, 539-549. [Ist. Patol. Spec. Med., Univ. Naples.] English summary.

Fractionation of proteins by salting out with Na thiosulphate was done on 20 normal human sera from 10 males and 10 females, using the salt in concentrations from 17 to 50 per cent., with 1 per cent. increments. When the average values for the protein content of the filtrate, estimated colorimetrically, were plotted against the corresponding saline concentrations, the curves for both males and females showed three main points of inflection at salt concentrations of 30.7, 36.4 and 42.4 per cent., thus permitting the separation of the serum proteins into 4 distinct fractions, presumably analogous to those obtained by electrophoresis. The real existence of these points of inflection was confirmed by their exact correspondence with three inflections in the curves of differentiation constructed according to Majoor (Abst. 2906, Vol. 17), and further confirmation was provided by a study of the statistical data. The author points out certain theoretical and practical advantages of using Na thiosulphate in the salting-out technique instead of other salts more commonly used, such as the sulphate or sulphite.—M. B. Richards.

2744

ORVIN, V. I. Sopostavlenie rezultatov opredelenii albumina i globulinov syvorotki krovi metodami elektroforeza i solevogo osazhdeniya. **[Comparison of the results of estimation of serum albumin and globulin by electrophoresis**

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and by salt precipitation.] *Biokhimiya*, 1953, **18**, 329-334. [Inst. Zhivot., Akad. Nauk Tadzhik. SSR].

The ratio of albumin to globulin in blood serum from normal human subjects or rabbits, or from rabbits with diseased livers, as estimated by electrophoresis, did not agree with that obtained by precipitation with 21 or 24 per cent. sodium sulphate. If the concentration of the sulphate was increased to 26.9 per cent. the agreement was better. In the blood serum of rabbits whose livers were damaged by subcutaneous injection of CCl_4 there was a large increase of β - and γ -globulin and a decrease of albumin.—W. Hughes.

2745

PENCE, J. W., WEINSTEIN, N. E. and MECHAM, D. K. **A method for the quantitative determination of albumins and globulins in wheat flour.** *Cereal Chem.*, 1954, **31**, 29-37. [W. Reg. Res. Lab., Bur. Agric. Indust. Chem., U.S. Dept. Agric., Albany, Calif.]

The method depends on the assumption that certain values of the amide N and tryptophan N content of albumins, globulins and gliadin are typical. Soluble proteins are extracted from flour with saline, and total N, N.P.N., tryptophan N and amide N are estimated in the extract. The desired values are then derived algebraically.—H. G. Bray.

See also Abst. 2991.

Lipoid Constituents

2746

RUSIN, I. M. and SARAİKINA, P. F. Opređenje žira v prostokvashe, atzidoofilne i kefire. **[Estimation of fat in curdled milk, acidophilin and kephir.]** *Vop. Pitan.*, 1954, **13**, 30-32. [Inst. F. F. Erisman, Moscow.]

The accuracy of methods for measuring the fat content of fermented milk products was investigated and causes of discrepancy between methods were estimated. When such errors were eliminated, it was found that there was no appreciable difference between the fat content of such products as curdled milk, acidophilin, and kephir and the original milk samples from which they were prepared.—D. W. Taylor.

2747

MAXCY, R. B. and SOMMER, H. H. **Fat separation in evaporated milk. 1. Homogenization, separation, and viscosity tests.** *J. Dairy Sci.*, 1954, **37**, 60-71. [Dept. Dairy Food Indust., Univ. Wisconsin, Madison.]

2748

BORGSTRÖM, B. **Investigation on lipid separation methods. 3. Separation of tri-, di-, 1-mono- and 2-mono-glycerides.** *Acta physiol. scand.*,

1954, **30**, 231-239. [Dept. Physiol. Chem., Univ. Lund.]

By means of a column of silicic acid and elution with a mixture of benzene with increasing amounts of chloroform, mixtures of tri-, di- and monoglycerides were effectively separated. Partial isomerisation of 2-monoglycerides occurred on the column. Mixtures of 1-mono- and 2-monoglycerides were separated from tri- and di-glycerides by partition chromatography with a mixture of heptane and 80 per cent. aqueous ethanol as solvent. For the resolution of monoglyceride mixtures the 1-monoglycerides were first oxidised with periodic acid, after which the oxidation product formed could be separated from the unchanged 2-monoglyceride by chromatography on a silicic acid column; benzene was used to elute the oxidation product and chloroform to remove the unchanged component.—G. A. Garton.

2749

HADORN, H. and JUNGKUNZ, R. Beitrag zur Bestimmung der Peroxydzahl. [Estimation of peroxide number.] *Mitt. Geb. Lebensmittel. Hyg.*, 1953, **44**, 495-500. [Lab. VSK, Basle.] French and English summaries.

Lea's original method (Abst. 374, Vol. 1) as modified by the authors (*Mitt. Geb. Lebensmittel. Hyg.*, 1951, **42**, 284) has been further modified so that much smaller amounts of KI are needed. The whole procedure is carried out in one vessel in an atmosphere of CO₂. The value of the index for judging the quality and stability of fats and oils is briefly discussed.—W. Godden.

2750

HARTMAN, L., HOOKER, C. N. and WATT, H. E. Colorimetric estimation of fat peroxides in meat. *N.Z. J. Sci. Technol. [B]*, 1954, **35**, 307-310. [Fats. Res. Lab., Dept. Sci. Indust. Res., Wellington.]

The method described is a modification of that of Hartman and Glavind (*Acta chem. scand.*, 1949, **3**, 954). The fat is extracted from the fresh meat by a mixture of equal volumes of *n*-propanol and xylene and the peroxide is estimated by measuring the extinction coefficient of the leuco base of dichlorophenolindophenol after interaction with the extracted fat. The method is rapid and does not call for the drying of the meat, and phosphatides do not interfere. It is not so accurate as the longer ferric thiocyanate method as modified by Smith (Abst. 137, Vol. 22).—W. Godden.

2751

HADORN, H. and JUNGKUNZ, R. Nachweis und annähernde Bestimmung von Cruciferenölen in Speiseölen nach dem Bleisalzverfahren. [Identification and approximate estimation of

oils of Cruciferae in edible oils by the lead salt method.] *Mitt. Geb. Lebensmittel. Hyg.*, 1953, **44**, 453-466. [Lab. VSK, Basle.] French and English summaries.

2752

BURTON, H. S. Separation of volatile acids by paper chromatography. *Nature*, 1954, **173**, 127. [Sir William Dunn Sch. Pathol., Univ. Oxford.]

The procedure described by Hiscox and Berridge (Abst. 4623, Vol. 20), in which the acids are applied to the paper as their ethylamine salts and the chromatogram is developed with aqueous butanol, is used. The paper is dried in a stream of air and a spray of bromocresol green is applied just behind the receding solvent front formed as the solvent evaporates. A faint blue background is produced with deep blue spots where acid is located.

H. G. Bray.

2753

SILK, M. H. and HAHN, H. H. The resolution of mixtures of C₁₆-C₂₄ normal-chain fatty acids by reversed-phase partition chromatography. *Biochem. J.*, 1954, **56**, 406-410. [Nat. Chem. Res. Lab., S. African Coun. Sci. Indust. Res., Pretoria.]

With the technique of Howard and Martin (Abst. 1353, Vol. 20), mixtures of palmitic, stearic, arachidic, behenic and lignoceric acids were effectively separated on a semi-quantitative scale. Resolution of normal-chain and corresponding iso-acids was not possible, as was evidenced by the failure to separate a mixture of stearic and 16-methylheptadecanoic-acids. Good qualitative separation of the unsaturated fatty acids of pilchard oil was obtained.—G. A. Garton.

2754

HILLIG, F. Rapid method for the estimation of water-insoluble fatty acids (WIA) in cream and butter. *J. Assoc. Off. Agric. Chem.*, 1953, **36**, 1077-1083. [Dept. Health, Washington 25, D.C.]

Cream, 20 g. or butter, 10 g., is shaken with ice-water and filtered through a special filter sieve. The collected fat is then washed with water and dissolved in ether and the ethereal solution is titrated against 0.05 N Na ethylate with phenolphthalein as indicator. For calculation purposes the mean molecular weight of water-insoluble acid is taken as 270. The estimation takes about 15 min.—G. A. Garton.

2755

MERTENS, E. and ALBERS, C. Über eine Modifikation der Cholesterinbestimmung im Blutserum nach Schönheimer und Sperry. [A modification of the Schoenheimer and Sperry

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method for estimating cholesterol in blood serum.] *Hoppe-Seyler's Ztschr.*, 1953, **293**, 244-253. [Med. Abt., Marienkrankenhaus, Hamburg.]

Methods for the estimation of cholesterol are reviewed; that of Schoenheimer and Sperry (Title, p. 463, Vol. 4) was chosen as most suitable. A modified procedure is described, which is claimed to be more reliable than the original.—H. G. Bray.

2756

BROWN, H. H., ZLATKIS, A., ZAK, B. and BOYLE, A. J. **Rapid procedure for determination of free serum cholesterol.** *Anal. Chem.*, 1954, **26**, 397-399. [Dept. Pathol., Coll. Med., Wayne Univ., Detroit, Mich.]

Two procedures are described. In the first, aluminium hydroxide is used as a "gathering agent" for the precipitate of cholesteryl digitonide; this is isolated and dissolved in acetic acid and the cholesterol present is estimated by means of the ferric chloride colour reagent of Zlatkis *et al.* (Abst. 3890, Vol. 23). In the second procedure, aluminium chloride is used to flocculate the digitonide, which is then isolated by centrifuging and treated as in the first procedure.—H. G. Bray.

2757

HUENNEKENS, F. M., HANAHAN, D. J. and UZIEL, M. **Paper chromatography of lecithins.** *J. Biol. Chem.*, 1954, **206**, 443-447. [Dept. Biochem., Univ. Washington, Seattle.]

Paper chromatography was used for the separation of a series of compounds derived from the unsaturated lecithin (dipalmitoleyl)-L- α -glycerylphosphorylcholine. With different solvent systems (*n*-butanol saturated with water, ethanol-water, *n*-propanol-water and *n*-propanol-acetic acid-water) the following compounds were separated and identified: the parent unsaturated lecithin, saturated lecithin, unsaturated lysolecithin, saturated lysolecithin, α -monopalmitin, $\alpha\beta$ -dipalmitolein, phosphatidic acid, oleic acid, glycerylphosphorylcholine, β -glycerophosphate, phosphorylcholine and choline. Spray reagents were used to detect phosphate, choline ester linkages and unsaturated groupings.—G. A. Garton.

Other Organic Constituents

2758

ELVING, P. J. and VAN ATTA, R. E. **Polarographic determination of citric acid. Polarography of pentabromoacetone.** *Anal. Chem.*, 1954, **26**, 295-298. [Pennsylvania State Univ., State College, Pa.]

2759

APPLETON, H. D., LA DU, B. N. (JR.), LEVY, B. B., STEELE, J. M. and BRODIE, B. B. **A chemical**

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method for the determination of free choline in plasma. *J. Biol. Chem.*, 1953, **205**, 803-813. [Res. Serv., Third (New York Univ.) Med. Div., Goldwater Mem. Hosp., New York.]

The method consists in extraction of the choline into acetone, evaporation of the acetone and removal of interfering substances from the aqueous phase by extraction first with *n*-butanol and then with isobutanol, each alcohol being saturated with 2 *N* HCl. The choline is precipitated as its periodide, containing 9 atoms I per mol., and estimated spectrophotometrically by measuring the optical density at 365 $m\mu$. This method avoids washing the precipitate, as I adsorbed on the periodide precipitate does not interfere in the measurement. Counter-current distribution and partition studies have shown the method to be specific for plasma choline, and as little as 5 μ g. can be estimated. The method does not appear to be applicable to urine or to homogenised organ tissues.

In 21 healthy adult men the values for choline in plasma ranged from 2.5 to 9.9 μ g. per ml., average 4.4. The values remained relatively constant over several months and were not increased after meals or by the oral administration of 5 g. choline as the bicarbonate salt.—W. Godden.

2760

FROHMAN, C. E. and ORTEN, J. M. **The fluorometric determination of polycarboxylic acids following chromatography.** *J. Biol. Chem.*, 1953, **205**, 717-723. [Dept. Physiol. Chem., Coll. Med., Wayne Univ., Detroit, Mich.]

2761

CAVALLINI, D. and FRONTALI, N. **Quantitative determination of keto-acids by paper partition chromatography.** *Biochim. biophys. Acta*, 1954, **13**, 439-445. [Inst. Biochem., Univ. Rome.] French and German summaries.

2762

ROSENTHALER, L. and VEGEZZI, G. **Über Farbreaktionen von Ketonen. [Colour reactions of ketones.]** *Mitt. Geb. Lebensmittel. Hyg.*, 1953, **44**, 475-484. [Lab. Eidg. Alkoholverwaltung, Berne.] French and English summaries.

2763

DAVIDSON, J. **Procedures for the extraction, separation and estimation of the major fat-soluble pigments of hay.** *J. Sci. Food Agric.*, 1954, **5**, 1-7. [Rowett Res. Inst., Bucksburn, Aberdeenshire.]

The comminuted hay is moistened with water, deep frozen and thawed to rupture cell membranes, and mechanically blended with the solvent and the pigments are extracted with 85 per cent.

aqueous acetone. After the addition of magnesium oxide the pigments are transferred to ether. This solvent is then removed by evaporation and the residue is dissolved in light petroleum. With a column of equal parts of sugar and anhydrous sodium sulphate the pigments are separated with a green solution containing chlorophylls *a* and *b* and a yellow solution containing phaeophytins *a* and *b*, carotene and xanthophyll. The chlorophylls are estimated spectrophotometrically in the green solution and the phaeophytins in the yellow solution, measurements being taken in the red region of the spectrum. From the yellow solution carotene and xanthophyll are separated chromatographically on a magnesium oxide column and estimated separately. Five samples of hay gave the following ranges of values, expressed as mg. per 100 g. dry matter: chlorophyll *a* 55 to 64; chlorophyll *b* 34 to 42; phaeophytin *a* 6 to 12; phaeophytin *b* 1 to 3; carotene 0.4 to 1.1; xanthophyll 2.6 to 4.2.—W. Godden.

2764

HOFFPAUIR, C. L. and PONS, W. A. (Jr.) **Review of the properties of gossypol and methods of its estimation.** *J. Assoc. Off. Agric. Chem.*, 1953, **36**, 1108-1118. [S. Reg. Res. Lab., New Orleans 19, La.]

Inorganic Constituents

2765

DIBLE, W. T., TRUOG, E. and BERGER, K. C. **Boron determination in soils and plants. Simplified curcumin procedure.** *Anal. Chem.*, 1954, **26**, 418-421. [Univ. Wisconsin, Madison.]

Available boron is estimated in an aqueous extract of soil and total B in an extract from soil fused with sodium carbonate. Total plant B is estimated in an extract of dry-ashed material. The extracts are treated with a curcumin (1:7-bis(4-hydroxy-3-methoxyphenyl)-1:6-heptadiene-3:5-dione-oxalic acid reagent at $55 \pm 3^\circ \text{C}$. and the red reaction product is extracted with ethanol and estimated colorimetrically.—H. G. Bray.

2766

DREVON, B., BERNARD, A. and MANDON, D. **Microdosage du Ca^{++} sanguin utilisant l'acide éthylène-diaminotétracétique et la murexide. [Micro-estimation of blood Ca^{++} with ethylenediaminetetracetic acid and murexide.]** *C.R. Soc. Biol.*, 1953, **147**, 1420-1424. [Lab. Pharm. Chim., Fac. Med.]

The method of Mason (Abst. 1292, Vol. 23) has been adapted for work on a micro-scale, the end-point being estimated by following photometrically the changes in optical density at $520 \text{ m}\mu$. The accuracy is ± 2 per cent. and the estimation is

completed in 10 min. A series of estimations should be checked against the results obtained with a standard solution containing 0.1 g. Ca per litre.—W. Godden.

2767

HÜBENER, H. J., MAURER, H. and WALTHER, T. **Eine einfache Differenzmethode zur genauen flammenphotometrischen Serum - Calcium-Bestimmung. [A simple difference method for accurate estimation of calcium in serum with the flame photometer.]** *Klin. Wochenschr.*, 1953, **31**, 1095-1096. [Inst. Veg. Physiol., Frankfurt a.M.]

Estimation of Ca in serum with the flame photometer suffers in accuracy from variations in the composition of the serum. To achieve greater accuracy it is suggested that a small amount of CaCl_2 be added to the serum, and that readings be taken of the serum with and without the added CaCl_2 , and of the CaCl_2 solution alone.

E. M. Hume.

2768

KIMBEL, K. H. **Zur Komplexon-Titration des Calciums im Serum. [On Komplexon titration of calcium in serum.]** *Hoppe-Seyler's Ztschr.*, 1953, **293**, 273-277. [Med. Poliklin., Univ. Würzburg.]

The method is considered from the point of view of its applicability to clinical investigations: suitable conditions are described. The dependence of the reaction on pH, precipitation conditions and the estimation of the end-point are considered in detail.—H. G. Bray.

2769

WARK, W. J. **Spectrographic analysis of minor elements extracted from plants and soils as dithizonates.** *Anal. Chem.*, 1954, **26**, 203-205. [Dept. Chem., Ontario Agric. Coll., Guelph.]

Cu, Co and Zn are extracted from ashed material as dithizone complexes. The recommended spectrographic procedure is described in detail.

H. G. Bray.

2770

HENNIG, K. and BURKHARDT, R. **Die quantitative, polarographische Bestimmung von Kupfer und Zink in der Weinasche. [Quantitative polarographic estimation of copper and zinc in ash of wine.]** *Ztschr. Lebensmittel-Untersuch. Forsch.*, 1954, **98**, 25-29. [Inst. Biochem., Geisenheim am Rhein.]

By the polarographic method described, Cu and Zn can be estimated quantitatively in the ash of 100 ml. wine. The method involves little expenditure of chemicals and time and is thus suitable for serial estimations.—M. B. Richards.

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2771

BINNERTS, W. T. **Determination of iodine in milk.** *Anal. chim. Acta*, 1954, **10**, 78-80. [Lab. Animal Physiol., Agric. University Coll., Wageningen, The Netherlands.] French and German summaries.

To 10 ml. of milk in Pyrex test tubes is added 1 ml. of a solution containing 2 per cent. NaOH and 1 per cent. KNO₃. Two periods of several hours' combustion at 550°C., during which another 1 ml. of the hydroxide-nitrate solution is added, are sufficient to give a white ash. A white-ash end-point is the criterion rather than a fixed time of heating. The ash is extracted several times with warm slightly alkaline water and filtered through Jena glass filters into 12-ml. Pyrex tubes. From this 10 ml. solution 1 ml. is used for photometry. The rate of disappearance of the yellow colour in the reaction between ceric sulphate and arsenious acid is a measure of the amount of iodine present. Two extinction readings with a 15-min. interval are taken. The reaction temperature is 30°C., but sensitivity to temperature change is very low.—B. W. Simpson.

2772

HÄBERLI, E. Eine Methode zur titrimetrischen Bestimmung des Eisens im Blut mit Hilfe von Komplexon. [A new method for titrimetric estimation of iron in blood by the use of Komplexon.] *Experientia*, 1954, **10**, 34-35. English summary.

A procedure is described for the volumetric estimation of total iron in blood using "Komplexon III" with catechol-3:5-disulphonic acid ("Tiron") as indicator. The method is not sensitive enough to be used for the estimation of serum Fe.—H. G. Bray.

2773

VENTURA, S. and WHITE, J. C. **The determination of iron and copper in single serum samples.** *Analyst*, 1954, **79**, 39-42. [Postgrad. Med. Sch., Ducane Rd., London, W.12.]

Four ml. serum is treated with 6 N HCl to liberate the metallic ions and deproteinised with trichloroacetic acid, and Fe and Cu in the filtrate are estimated with 2:2'-dipyridyl and sodium diethyldithiocarbamate, respectively. The dipyridyl colour is first developed and then the copper diethyldithiocarbamate complex is formed and extracted with ether and amyl alcohol, and the optical density of the 2 phases is measured.

H. G. Bray.

2774

CHEONG, L., PERRI, G. C. and SHARPE, L. M. **Assay of radioiron and radiosilver in biological samples.** *Anal. Chem.*, 1954, **26**, 242-243. [Div. Phys., Sloan-Kettering Inst., New York 21.]

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2775

DESPAUL, J. E. and COLEMAN, C. H. **Comparison of results of analyses of phosphorus in fruit spreads by official volumetric and rapid colorimetric procedures.** *J. Assoc. Off. Agric. Chem.*, 1953, **36**, 1088-1093. [Chicago Quartermaster Depot, U.S. Army, Chicago 9, Ill.]

2776

BERNSTEIN, R. E. **Serum and plasma preparation for potassium analysis: effects of anticoagulants, storage time and temperature before separation, and haemolysis.** *S. African J. Med. Sci.*, 1953, **18**, 99-104. [Dept. Physiol., Med. Sch., Univ. Witwatersrand, Johannesburg.]

Owing to exchanges of K between red cells and serum or plasma heparinised blood is to be preferred to clotted blood for K estimations. Inorganic salt anticoagulants are unsuitable. For accurate results heparinised blood should be centrifuged immediately after collection, but blood samples, heparinised or allowed to clot, kept at room temperature and separated at a fixed time within 1 to 6 hr. after collection will yield comparable results. After a longer interval there is a progressive increase in the K value.

W. Godden.

2777

DESPAUL, J. E., WEISSMAN, H. B. and BARSKY, M. H. **Comparison of results of analyses for potassium in jam and jelly by the chloroplatinate and flame photometer methods.** *J. Assoc. Off. Agric. Chem.*, 1953, **36**, 1083-1087. [Chicago Quartermaster Depot, U.S. Army, Chicago 9, Ill.]

2778

BAUSERMAN, H. M. and CERNEY, R. R. (Jr.). **Flame spectrophotometric determination of sodium and potassium in viscous solutions or plant extracts.** *Anal. Chem.*, 1953, **25**, 1821-1830. [Res. Lab., American Crystal Sugar Co., Rocky Ford, Colo.]

2779

KINGSLEY, G. R. and SCHAFFERT, R. R. **Micro flame photometric determination of sodium, potassium, and calcium in serum with organic solvents.** *J. Biol. Chem.*, 1954, **206**, 807-815. [Dept. Physiol. Chem., Sch. Med., Univ. California, Los Angeles.]

It is shown that the use of an organic solvent, consisting of 675 ml. acetone, 225 ml. glacial acetic acid and 100 ml. 0.2 per cent. Sterox (a non-ionic wetting agent) in water is advantageous in the direct micro-estimation of Na, K and Ca in serum and urine. Technical details are given in full.—W. Godden.

2780

SUTTON, W. J. L. and ALMY, E. F. **Separation of sodium, potassium, magnesium, and calcium in milk ash by ion-exchange chromatography.** *J. Dairy Sci.*, 1953, **36**, 1248-1254. [Dept. Agric. Biochem., Ohio State Univ., Columbus.]

The ion-exchange resin (Dowex-50) is first converted to its acid form and the sample is added. Na and K are eluted successively by 0.7 N HCl. Mg and Ca are then eluted with 1.0 N HCl and the metals in the eluate fractions are estimated quantitatively. Cation-bound chloride is estimated by titration with AgNO₃.—H. G. Bray.

2781

HARRISON, G. E., RAYMOND, W. H. A. and SUTTON, A. **The estimation of radioactive strontium in the excreta.** *Clin. Sci.*, 1954, **13**, 61-67. [Med. Res. Counc. Radiobiol. Res. Unit, Atomic Energy Res. Establishment, Harwell.]

2782

DICKINSON, D. and HOLT, R. **The determination of tin in canned foods.** *Analyst*, 1954, **79**, 104-106. [Fruit Veg. Canning and Quick Freezing Res. Assoc., Chipping Campden, Gloucestershire.]

2783

BANKS, T. E., TUPPER, R., WATTS, R. W. E. and WORMALL, A. **Estimation of zinc in biological specimens. Determination of zinc-65.** *Nature*, 1954, **173**, 348-349. [Dept. Biochem., St. Bartholomew's Hosp. Med. Coll., London, E.C.1.]

Three methods are outlined: (1) a wet combustion method in which the tissue is digested as for a Kjeldahl total N estimation and the radio-activity of the diluted digest is measured by a Veall-type liquid counter; (2) an extraction method for use when other radio-active isotopes also are present: Zn is separated from a digest prepared as above as its dithizone complex, which is soluble in CCl₄, the complex in solution in this solvent is decomposed with HCl, which also extracts the Zn, and the radio-activity of the acid extract is measured by a liquid counter; (3) a scintillation method applicable to homogenised tissues or digests.

H. G. Bray.

Miscellaneous

2784

PIEN, J., DÉSRANT, J. and LEFÈVRE, B. **La recherche de la margarine dans les beurres. [Detection of margarine in butter.]** *Lait*, 1954, **34**, 11-22.

In 1931 an order was made compelling all manufacturers of margarine to incorporate 2 g. potato or rice starch per kg. in their product. In 1932 a

technique was published for the detection of starch in butter and hence of the adulteration of butter with margarine. Recently samples of butter, free from margarine, have been found to contain traces of starches of different kinds. A method is now described in detail for isolating, by a series of treatments with fat solvents and centrifuging followed by a series of washings first with dilute ammonia and centrifuging and finally with dilute HCl and centrifuging, the starch grains free from fat and casein. These can be counted in a haemocytometer or treated with Lugol's solution and the colour measured. If the total number of potato starch grains is less than 100,000 margarine is not present or at most in amount less than 1 per cent. in the butter. If no colour is detected with the iodine solution, less than 0.1 per cent. is present.

W. Godden.

2785

SHAW, T. M., ELSKEN, R. H. and KUNSMAN, C. H. **Moisture determination of foods by hydrogen nuclei magnetic resonance.** *J. Assoc. Off. Agric. Chem.*, 1953, **36**, 1070-1076. [W. Reg. Res. Lab., Albany 6, Calif.]

The magnetic resonance absorption due to hydrogen nuclei previously found suitable for the estimation of water in hygroscopic materials (Shaw and Elskén, *J. Chem. Phys.*, 1950, **18**, 1113) has been found applicable, with certain limitations, to the estimation of the water content of foods. It is thought that these limitations on the precision of the method may be reduced by changes in the experimental conditions.—W. Godden.

2786

ZBARSKII, N. SH., EGOROVA, A. E. and ISAIKIN, A. M. **Rezultaty islytaniya pribora K. N. Chizhovoi dlya opredeleniya vlazhnosti testa i khleba. [Results of a trial of the apparatus devised by K. N. Chizhova for estimating moisture in dough and bread.]** *Vop. Pitan.*, 1954, **13**, 43. [Central Lab. "Glavkhleb", Leningrad.]

The apparatus consists of two aluminium plates hinged together at a distance from each other that can be varied. They are heated electrically and have thermometer sockets. Special packets made from filter paper are heated to 130° C. and cooled in a desiccator. Weighed portions of the material under investigation are spread in a uniform layer in the packets and placed for 5 min. in the apparatus at 160° C. A formula for moisture content is given. The results are said to be comparable with those obtained by drying to constant weight.

D. W. Taylor.

2787

ABRAMSON, E. **Ein Vergleich verschiedener Methoden für die Bestimmung des Wassergehaltes in Honig. [Comparison of different**

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methods for estimating the water content of honey.] *Mitt. Geb. Lebensmittel. Hyg.*, 1953, **44**, 468-471. [Staat. Inst. Volksgesundheit, Sweden.] French and English summaries.

2788

SCHLÜTZ, G. O. Anordnung und Vorrichtung zur quantitativen Mikrobestimmung von chemischen Elementen in biologischen und anderen Flüssigkeiten mittels Hochfrequenz-Entladungs-photometrie. [Method and apparatus for the quantitative micro-estimation of chem-

ical elements in biological and other fluids by high frequency discharge photometry.] *Hoppe-Seyler's Ztschr.*, 1953, **293**, 254-256. [Diagnost. Inst., Freiburg i. Br.]

2789

HAND, D. B., ROBINSON, W. B., WISHNETSKY, T. and RANSFORD, J. R. Color measurement. Application to food quality grades. *J. Agric. Food Chem.*, 1953, **1**, 1209-1212. [Div. Food, Sci., Technol., New York State Agric. Exp. Stat., Geneva.]

CLINICAL AND EXPERIMENTAL

2790

MCINROY, R. A. A micro-haematocrit for determining the packed cell volume and haemoglobin concentration on capillary blood. *J. Clin. Pathol.*, 1954, **7**, 32-36. [Dept. Pathol. (Univ. St. Andrews), Royal Infirmary, Dundee.]

2791

VAZQUEZ, O. N., NEWERLY, K., YALO, R. S. and BERSON, S. A. Estimation of trapped plasma with I^{131} albumin; critique of methods. *J. Appl. Physiol.*, 1954, **6**, 437-440. [Radioisotope Unit, Vet. Admin. Hosp., Bronx, N.Y.]

It is concluded that errors in haematocrit measurements due to trapped plasma should be studied by means of materials which do not penetrate the erythrocyte. Under the conditions used in this investigation the error was estimated to be less than 2 per cent.—H. G. Bray.

2792

NYLIN, G. Circulatory studies with radio-active isotopes. *Acta med. scand.*, 1954, **147**, 275-298. [Stockholm.]

This is an account of 10 years' work in the development and use of techniques for labelling red blood cells with ^{32}P or radio-active thorium B. With a very small amount of activity, about 0.03 mC. ^{32}P , labelled blood cells lose only 2 or 3 per cent. of their activity in an hour although plasma activity declines more rapidly. This permits more accurate estimation of blood volume than is possible with T-1824. With thorium B the red cells remain constantly labelled for from 1 to 2 hr.

The techniques have been applied to the study of a number of problems concerned with circulation and mixing of blood in normal subjects and in patients with heart disorders.—D. Duncan.

2793

HEVESY, G. and NYLIN, G. Application of "Thorium B" labeled red corpuscles in blood volume studies. *Circulation Res.*, 1953,

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1, 102-111. [Cardiovascular Clin., Södersjukhus, Stockholm.]

Thorium B is a satisfactory isotope for labelling red blood cells; the activity of re-injected labelled cells remains almost constant for at least an hour and decays by only one-third to one-quarter in 24 hr. About 99 per cent. accumulates in the red corpuscles. The method described is simple, requiring no centrifuging of blood samples and no calculation of cell: plasma ratios.—D. Duncan.

2794

JENNINGS, F. W., LAUDER, I. M., MULLIGAN, W. and URQUHART, G. M. Some applications of radioactive isotopes in veterinary research. *Vet. Rec.*, 1954, **66**, 155-161. [Vet. Sch., Univ. Glasgow.]

2795

WHITING, J. A. and HOTZ, R. An evaluation of the Evans blue dye T-1824 method for studying the circulating blood volume. *Surg. Gynecol. Obstet.*, 1953, **97**, 709-718. [Dept. Surg., St. Vincent's Hosp., Toledo, Ohio.]

It is concluded that the method is especially suitable for use in the average hospital where special apparatus is not available.—H. G. Bray.

2796

MILNOR, W. R., TALBOT, S. A., MCKEEVER, W. P., MARYE, R. B. and NEWMAN, E. V. A photoelectric ear densitometer for continuously recording the arterial concentration of T-1824 in the dye-dilution method. *Circulation Res.*, 1953, **1**, 117-121. [Dept. Med., Sch. Med., Johns Hopkins Univ., Baltimore, Md.]

2797

PIETTE, M. and POUILLAIN, P. Détermination du volume sanguin par la polyvinylpyrrolidone. [Estimation of blood volume with polyvinylpyrrolidone.] *Bull. Soc. Chim. biol.*, 1953, **35**, 1437-1439. [Lab. Hématol., Fac. Pharm., Paris.]

A modification of the method previously described (Title 4013, Vol. 18). After injection of the polyvinylpyrrolidone blood is collected and centrifuged and the plasma deproteinised with ferric sulphate and calcium carbonate. The polyvinylpyrrolidone is estimated colorimetrically with iodine at pH 2.2.—H. G. Bray.

2798

GOODALE, W. T. and HACKEL, D. B. **Measurement of coronary blood flow in dogs and man from rate of myocardial nitrous oxide desaturation.** *Circulation Res.*, 1953, **1**, 502-508. [Dept. Med., Peter Bent Brigham Hosp., Boston, Mass.]

2799

SIMON, N. **Radioactive gold in filter paper electrophoresis patterns of plasma.** *Science*, 1954, **119**, 95-96. [Dept. Phys., Mount Sinai Hosp., New York.]

Radio-active colloidal gold, ^{198}Au , was added to normal plasma, which was then subjected to electrophoresis on filter paper. The distribution of radioactivity was measured by Geiger Müller counter and radio-autography. Gold was shown to be bound to α - and β -globulin fractions. Similar results were obtained with ascitic fluid.

H. G. Bray.

2800

KARLBERG, P. **Determination of standard energy metabolism (basal metabolism) in normal infants.** *Acta paediat.*, 1953, **42**, 576-580.

See Abst. 3144, Vol. 23.

2801

WATTS, D. T. and GOURLEY, D. R. H. **A simple apparatus for determining basal metabolism of small animals in student laboratory.** *Proc. Soc. Exp. Biol. Med.*, 1953, **84**, 585-586. [Dept. Pharmacol., Med. Sch., Univ. Virginia, Charlottesville.]

2802

SCHOFFA, G. Eine einfache Formel zur Berechnung des Grundumsatzes nach den Versuchsdaten. **[A simple formula for calculating basal metabolism from the experimental data.]** *Ztschr. ges. inn. Med.*, 1953, **8**, 829-833. [Inn. Abt., Krankenhaus, Oranienburg.]

A formula is given for calculating B.M.R. from the total volume, and the content of CO_2 and O_2 , of the expired air collected in a Douglas bag, in conjunction with a reduction factor depending on temperature and atmospheric pressure. Tables are given for the reduction factor and for logarithms of numbers used in the calculation. The method avoids the correction for variations in the R.Q.

A. M. Copping.

2803

PERKINS, J. F. (Jr.) **Plastic Douglas bags.** *J. Appl. Physiol.*, 1954, **6**, 445-447. [Dept. Physiol., Univ. Chicago, Ill.]

A description of Douglas bags of different types, made of 12 gauge vinyl plastic sheeting.

H. G. Bray.

2804

GANSLEN, R. V. and VAN HUSS, W. D. **An ultra-light (700 gram) apparatus for the study of energy cost of industrial work and sports.** *Arbeitsphysiologie*, 1953, **15**, 207-210. [Dept. Physiol., Univ. Arkansas.]

The apparatus consists of an aluminium wire frame, a latex meteorological balloon of capacity 350 litres and a mouth valve, the total weight of which is 700 g. The apparatus is more compact and materially cheaper than the Douglas bag and does not interfere with the wearer's movements. The gas samples should be removed from the balloon within 30 min. of collection to avoid loss due to slow diffusion through the latex rubber.

W. Godden.

2805

CHYLA, G. and KELLER, N. Ein neues Gerät zur fraktionierten Magensafttitration. **[New apparatus for fractional titration of gastric juice.]** *Deutsch. med. Wochenschr.*, 1954, **79**, 375. [Med. Klin., Justus Liebig Hochsch., Giessen.]

2806

DALSETH, I. Et modifisert Ewalds prøvemåltids virkning ved pseudoachyli. **[A modification of Ewald's test meal and its effect on pseudo-achylia.]** *Nord. Med.*, 1954, **51**, 409-410. [Sykehus, Stokmarknes.] English summary.

The Ewald test meal has not been found uniformly satisfactory and is often followed by a histamine test. To obviate the histamine test the addition of yeast or of vitamin B complex tablets has been recommended. Further tests have not shown any advantage from either modification of the test meal.—I. Leitch.

2807

BAZANOVA, N. Y., STEFANKINA, M. K. and ARKH-ANGELSKAYA, M. F. K metodike izucheniya deyatel'nosti pishchevaritel'nogo trakta verbl'yuda. **[Method of studying the activity of the gastro-intestinal tract in the camel.]** *Fiziol. Zh. S.S.S.R. Sechenova*, 1953, **39**, 632-633. [Lab. Vozrast. Physiol., Inst. Exp. Biol., Akad. Nauk Kazakh. SSR, Alma-Ata.]

The animal studied was a 10-month-old Bactrian camel. Full details are given of the operation for an external duodenal anastomosis, and of pre-operative and post-operative care.

D. W. Taylor.

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2808

SPEERBER, I., HYDÉN, S. and EKMAN, J. **The use of polyethylene glycol as a reference substance in the study of ruminant digestion.** *Kgl. Lantbrukshögsk. Ann.*, 1953, **20**, 337-344. [Inst. Animal Physiol.]

Polyethylene glycol is not adsorbed or destroyed to any measurable extent in the rumen contents, and 90 per cent. or more can be recovered in the faeces. There was no evidence of its absorption, as none appeared in the urine after oral administration although it was soon detected in the urine after injection of small quantities into the blood. It appears that it can be used to estimate the flow of digesta from the reticulo-omasal orifice and to assess the flow of water and of dissolved substances from the rumen. An example of its use is given, and the conclusions drawn agree fairly satisfactorily with other relevant data.—A. T. Phillipson.

2809

MICHAEL, S. J. and MCKINLEY, R. E. **Rumeno-tomy simplified.** *J. Amer. Vet. Med. Assoc.*, 1954, **124**, 26-27. [Erie, Pa.]

A simple rumen retractor enables rumenotomy to be performed without assistance, and at the same time gives added protection against contamination of the wound.

The instrument consists of an aluminium ring with a slightly smaller rubber ring attached to its inner circumference. This double ring is suspended by a web strap attached to the skin on the right side of the animal by a spring clip. To the rubber ring is attached a series of sharp-pointed hooks, which can be inserted into the margins of the incision in the rumen; these can then be withdrawn from the abdominal cavity and lapped 1 to 2 in. over the margins of the skin incision.

W. A. Greig.

2810

KROC, R. L., PHILLIPS, G. E., STASILLI, N. R. and MALAMENT, S. **Antigoitrogenic and calorogenic assay of thyroglobulin, desiccated thyroid and l-thyroxine by different routes of administration in rats.** *J. Clin. Endocrinol.*, 1954, **14**, 56-69. [Res. Div., Warner-Chilcott Labs., Morris Plains, N.J.]

Two methods of bio-assay were used, anti-goitrogenic and calorogenic, to compare the activity of thyroglobulin with that of l-thyroxine sodium pentahydrate. The activities of 3 commercial products were ascertained at the same time. Different routes of administration were also compared. Assigning the value 100 to the activity of l-thyroxine administered subcutaneously, the anti-goitrogenic and calorogenic activities of thyroglobulin were 349 and 345, respectively. When they were given by mouth the activities of thyro-

globulin were 183 and 88 and those of l-thyroxine 34 and 26 by the anti-goitrogenic and calorogenic methods, respectively. The 2 methods gave results in fairly good agreement for the relative potencies of l-thyroxine sodium and soluble thyroglobulin administered as solutions subcutaneously or by mouth, but gave different results for the activities of the commercial products. The anti-goitrogenic assays of these gave values three times as high as those by the calorogenic assays. The method of assay of commercial products should, therefore, be stated. Soluble thyroglobulin was equally active whether administered intravenously, intraperitoneally or subcutaneously. The rate of absorption did not explain the fact that the activity of thyroglobulin was greater than could be accounted for by its thyroxine iodine content.

B. W. Simpson.

2811

DISCOMBE, G. **Laboratory investigations in the diagnosis of iron-deficiency and simple chronic anaemia.** *Brit. Med. J.*, 1954, **i**, 386-387. [Central Middlesex Hosp., Park Royal, London, N.W. 10.]

2812

KEYES, P. H. **An efficient water system for small laboratory animals.** *J. Dent. Res.*, 1953, **32**, 868-870. [Dept. Clin. Dent., Harvard Sch. Dent. Med., Boston, Mass.]

The preparation of drinking tubes and water bottles to ensure an adequate supply for experimental hamsters and rats is described.

D. Duncan.

2813

JONES, LL. I. **Measurement of palatability.** *Proc. Vith Internat. Grassland Congr.*, 1952, 1348-1353. [Welsh Plant Breeding Stat., Penglais, Aberystwyth.]

2814

BRUGMAN, H. H. and MARTIN, R. **A portable scale for cattle research.** *J. Animal Sci.* 1954, **13**, 74-80. [Dept. Animal Indust., Univ. Maine.]

The adaptation, for mobile field units, of a stationary scale that can weigh up to 3500 lb., by mounting it on a trailer and building a crate on to the platform, is described, with photographs and diagrams.—T. D. Bell.

2815

ERIKSSON, S. **Accuracy in determining digestibility of poultry feeds.** *Kgl. Lantbrukshögsk. Ann.*, 1953, **20**, 7-18. [Inst. Animal Nutrit.]

A comparison of direct and indirect methods of estimating the digestibility of poultry feeds was made with hens fed individually. Indirect estimations were made with chromic oxide, either 1.5

g. given daily or 1 per cent. mixed with the feed. In 2 series of experiments controlled daily feed intake with 6-day collection periods was compared with feeding to appetite and 2-day collection periods. The average digestion coefficients of the proximate nutrients were the same for both direct and indirect estimations and for the 2 methods of feeding. The indirect method was less reliable than the direct method with feeding to appetite.

D. M. Walker.

2816

MAL'CHEVSKII, A. S. and KADOCHNIKOV, N. P. Metodika prizhiznennogo izucheniya pitaniya gnezhdovykh ptentzov nasekomoyadnykh ptitz. [Methods in the contemporary study of the nutrition of fledgelings of insectivorous birds.]

Zool. Zh., 1953, 32, 277-282. [Leningrad Gosud. Univ.]

The method consists in applying a ligature of suitable material to the neck of the fledgeling in such a way as to prevent swallowing without inhibiting respiration. After a given period of feeding by the parents, the material is easily extracted from the oesophagus with forceps and analysed. The length of time for which such an experiment can be permitted, and the conditions of observation generally, depend on the species. Subject to safeguards, the fledgelings do not appear to suffer, and the method is contrasted with the waste and destruction when gastric analysis is employed. Results are described for a large number of species.—D. W. Taylor.

See also Absts. 3436, 3515.

COOKING, STERILISATION AND PRESERVATION OF FOOD

2817

SELESTE, E. The keeping quality of cow's milk and mother's milk. Investigations with reference to temperature, heat treatment, changes in flavour and pH, and the lysozyme content. *Ann. Med. exp. Biol. Fenn.*, 1953, 31, Suppl. 8, pp. 78. [Child. Clin., Univ. Helsinki.]

The literature is reviewed. Experiments were made on the effects of storage temperature and methods of pasteurisation on cow's milk and breast milk. The latter retained its flavour and pH well for short periods, up to 5 days, at 18°, 20°, or even 37° C., but did not keep well in the refrigerator at 4° C. The reverse was found with cow's milk. After inoculation with *Streptococcus lactis* breast milk retained flavour and pH more satisfactorily at 18° or 20° C. than in the refrigerator. There was no correlation between flavour and pH in milk, and pH variations were not a reliable guide to quality.

Pasteurisation for a short time at high temperature was more satisfactory for cow's milk and by the holder method at lower temperature for breast milk. The lysozyme activity of breast milk was high and that of cow's milk very low. Lysozyme activity was retained in breast milk after pasteurisation. Lysozyme activity was probably partly responsible for the keeping quality of good samples of breast milk.—A. M. Copping.

2818

PATTON, S., KEENEY, P. G. and HERALD, C. T. The role of lactones in flavour deterioration of milk fat. *Science*, 1954, 119, 218-219. [Pennsylvania Agric. Exp. Stat., State College.]

There are indications that the coconut-like off-flavour developed by milk fat during storage may be due to the presence of δ -decalactone. Storage

in vacuum or inert gas will not prevent its occurrence; the only method so far found satisfactory is to keep it at low temperature, 0° C. or below. These preliminary findings, while not excluding an effect of minute amounts of oxygen, suggest that non-oxidative rearrangement of unsaturated fatty acids to lactones may be the cause.—D. Harvey.

2819

DESOUTTER, M. Essais de mise en conserve de lait écrémé par ensilage. [Conservation of skimmed milk as silage.] *Lait*, 1954, 34, 35-39.

2820

EL-SOKKARY, A. M. and ZAKI, M. H. Stability of buffalo, cow, sheep and goat samna (ghee) against oxidative deterioration. *Indian J. Dairy Sci.*, 1953, 6, 217-221. [Fac. Agric., Ibrahim Univ., Shebin El-Kom, Egypt.]

There was little difference in the composition of samna prepared from buffalo, cow, ewe or goat milk. A typical analysis (buffalo samna) was: water 0.34, fat 99.34, solids-not-fat 0.34 per cent.

Samples were held at 78° C. and peroxide values were estimated at 24-hr. intervals. The periods elapsing before a peroxide value of 5 was reached were: buffalo 146, cow 176, ewe 149, goat 218 hr. The comparatively high stability of goat samna may be due to the presence of fat-soluble anti-oxidants.—P. C. Jowsey.

2821

MORRIS, S. G. Fat rancidity. Recent studies on the mechanism of fat oxidation in its relation to rancidity. *J. Agric. Food Chem.*, 1954, 2, 126-132. [E. Reg. Res. Lab., Philadelphia 18, Pa.]

2822

TAPPEL, A. L. **Oxidative fat rancidity in food products. 1. Linoleate oxidation catalyzed by hemin, hemoglobin, and cytochrome c.** *Food Res.*, 1953, **18**, 560-573. [Dept. Food Technol., Univ. California, Davis.]

Haemin, Hb and cytochrome c were found to be relatively powerful as catalysts of the oxidation of linoleate at 0° C. and, except for lipoxidase (see Title 2743, Vol. 23), appeared to be the most active of naturally-occurring oxidising catalysts. The oxidation of pork fat was attributable to its haematin content rather than to a simple process of auto-oxidation. The activation energy of linoleate oxidation catalysed by haematin compounds was found to be low compared with that of auto-catalytic linoleate oxidation, which may explain the need for exclusion of O₂ or the addition of anti-oxidants or both if a reasonable storage life is to be attained at conventional temperatures for freezing such foods as pork, fish and poultry.

In concentrations 2×10^{-3} M α -tocopherol *nordihydroguaiaretic* acid and propyl gallate were effective in inhibiting haemin-catalysed oxidation when they were initially present, but such a concentration did not stop oxidation once started. During linoleate oxidation in the presence of haemin the enzyme was co-oxidised and Fe was released.—D. Harvey.

2823

HARTMAN, L. and WHITE, M. D. L. **Stability of edible tallow from mutton and beef. 2. Suppression of the deleterious effect of trace metals.** *N.Z. J. Sci. Technol. [B]*, 1953, **35**, 254-258. [Fats Res. Lab., Dept. Sci. Indust. Res., Wellington.]

For Part 1 see Abst. 2742, Vol. 23.

Two procedures for removing Cu and Fe from edible tallow and the effects of 5 de-activators, citric, tartaric, citraconic and gluconic acids and commercial ethylenediamine tetra-acetic acid, were tested. There was no correlation between Fe content and stability and the amount of Cu was too small to justify a similar conclusion. Citric and tartaric acids were the most effective of the de-activators, but their use in New Zealand is prohibited by food regulations.—D. Harvey.

2824

KANTHARAJ URS, M., SAHASRABUDHE, M. R., BHATIA, D. S. and NATARAJAN, C. P. **Studies on the storage behaviour of mustard and groundnut oils in galvanized iron containers.** *Bull. Central Food Technol. Res. Inst., Mysore*, 1953, **3**, 17-18.

Fresh, peroxide-free samples of mustard oil and of crude and refined groundnut oils were stored in glass, tin and galvanised iron containers of capacity

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4 oz. Peroxide and acid values were estimated at intervals during 36 weeks' storage at room temperature, 37° or 50° C.

At 37° C. the acidity of oils stored in tin or glass increased over 36 weeks; in galvanised cans the acidity was neutralised to some extent by Zn dissolved from the surface of the container. All the oils at all temperatures dissolved Zn; the amount ranged from 32 p.p.m. for refined groundnut oil stored at room temperature to 1228 p.p.m. for crude groundnut oil stored at 50° C. In general, the higher the storage temperature, the greater the amount dissolved.

It was concluded that mustard oil, which is never refined, and crude groundnut oil should not be stored in galvanised containers.—P. C. Jowsey.

2825

KRAYBILL, H. R. and DUGAN, L. R. (Jr.) **Anti-oxidants. New developments for food use.** *J. Agric. Food Chem.*, 1954, **2**, 81-84. [Amer. Meat Inst. Found., Chicago, Ill.]

2826

DEUEL, H. J. (Jr.), ALFIN-SLATER, R., WEIL, C. S. and SMYTH, H. F. (Jr.) **Sorbic acid as a fungistatic agent for foods. 1. Harmlessness of sorbic acid as a dietary component.**

DEUEL, H. J. (Jr.), CALBERT, C. E., ANISFELD, L., MCKEEHAN, H. and BLUNDEN, H. D. **2. Metabolism of α , β -unsaturated fatty acids with emphasis on sorbic acid.**

MELNICK, D. and LUCKMANN, F. H. **3. Spectrophotometric determination of sorbic acid in cheese and in cheese wrappers. 4. Migration of sorbic acid from wrapper into cheese.**

MELNICK, D., LUCKMANN, F. H. and GOODING, C. M. **5. Resistance of sorbic acid in cheese to oxidative deterioration. 6. Metabolic degradation of sorbic acid in cheese by molds and the mechanism of mold inhibition.**

SMITH, D. P. and ROLLIN, N. J. **7. Effectiveness of sorbic acid in protecting cheese.** *Food Res.*, 1954, **19**, 1-12; 13-19; 20-27; 28-32; 33-43; 44-58; 59-65. [Dept. Biochem. Nutrit., Sch. Med., Univ. S. California, Los Angeles.]

2827

WANG, H., AUERBACH, E., BATES, V., ANDREWS, F., DOTY, D. M. and KRAYBILL, H. R. **A histological and histochemical study of beef dehydration. 2. Influence of carcass grade, aging, muscle and electrolysis pre-treatment.** *Food Res.*, 1954, **19**, 154-161. [Amer. Meat Inst. Found., Univ. Chicago, Ill.]

For part 1 see Abst. 176, Vol. 24.

Cylindrical portions of 2 muscles, *Rectus femoris* and *Biceps femoris*, were taken from beef carcasses of 4 grades of quality when fresh and after

storage for 7 or 14 days. One set of samples underwent electrolysis before dehydration at 70° C.; a control set was not electrolysed before treatment. All were subsequently rehydrated. Neither grade of carcass nor length of ageing period influenced dehydration or rehydration.

During electrolysis potassium was lost from and water was taken up by the tissue. Rehydration was much more rapid and complete by the electrolysed than by the non-electrolysed samples.

D. Harvey.

2828

ALDRICH, P. J. and LOWE, B. **Comparison of grades of beef rounds. Effect of cooking times on palatability and cost.** *J. Amer. Dietetic Assoc.*, 1954, **30**, 39-43. [Dept. Food Nutrit., Iowa State Coll., Ames.]

2829

LERCHE, M. Die Bedeutung des Ausruhens der Schlachttiere für die Fleischwarenqualität. [Importance of resting animals before slaughter for the quality of meat products.] *Berl. Münch. tierärztl. Wochenschr.*, 1954, **67**, 40-43. [Inst. Lebensmittelhyg., Freie Univ. Berlin.] English summary.

Unsatisfactory canned ham was traced to the use of soft, insufficiently bled meat from pigs which had been transported for long distances and not properly rested before slaughter. After curing and before canning, such hams often showed poor appearance, consistency and odour, and the pH tended to be higher than that of hams from properly slaughtered pigs, though poor quality and high pH did not always go together. Careful investigation of the period of rest required is called for.—W. M. Deans.

2830

SWICKARD, M. T., HARKIN, A. M. and PAUL, B. J. **Relationship of cooking methods, grades, and frozen storage to quality of cooked mature Leghorn hens.** *U.S. Dept. Agric. Tech. Bull.* No. 1077, January 1954, pp. 32.

2831

COPPOCK, J. B. M., COOKSON, M. A. and LANEY, D. H. (with AXFORD, D. W. E.) **The role of glycerides in baking.** *J. Sci. Food Agric.*, 1954, **5**, 8-26. [British Baking Indust. Res. Assoc., Chorleywood, Herts.]

2832

PINGALE, S. V., NARAYANA RAO, M. and SWAMINATHAN, M. **Effect of insect infestation on stored grain. 1. Studies on soft wheat.** *J. Sci. Food Agric.*, 1954, **5**, 51-54. [Central Food Technol. Res. Inst., Mysore, India.]

Soft wheat in 70-lb. lots in closely woven bamboo bins was infested with 100 adults of *Calandria oryzae*, L. (weevil), *Trogoderma granaria*, E. (khapra beetle) and *Ephestia cautella*, W. (almond moth) and kept for 6 months at temperatures between 78° and 84° F. and humidities between 48 and 62 per cent. Samples were examined monthly and N, moisture, ash, fat, fat acidity and reducing sugars were estimated by A.O.A.C. methods and vitamin B₁ by Swaminathan's modification of the thiochrome method (Abst. 2033, Vol. 12).

Weight loss was considerable, especially with weevils. There was little effect on percentage total N or reducing sugars; the rise in fat acidity was greater in infested samples than in controls, but there was no off-flavour. About half the initial vitamin B₁ content of 4.5 µg. per g. was lost after 3 months; the worst loss was with *Ephestia*, which eats the germ only. This is serious in countries such as India, where the people live largely on cereals.—W. M. Deans.

2833

A statement of general policy concerning the addition of specific nutrients to foods. *J. Amer. Med. Assoc.*, 1954, **154**, 145.

Joint statement by Food and Nutrition Board, National Research Council and Council on Foods and Nutrition of the American Medical Association.

2834

SIEDLECKA, J. and GILEWSKA, C. Nowowyprodukowane barwniki do barwienia artykułów żywności. [Some new colouring agents for foods.] *Rocz. Państwowego Zakł. Hig.*, 1953, No. 3, 283-289. Russian and French summaries.

2835

GREKOWICZ, M. and PLISZKA, A. Wyniki badań biologicznych nad stopniem toksyczności krajowych barwników żywnościowych, pochodnych PAS' u. [Biological studies on the toxicity of four derivatives of p-aminosalicylic acid used for colouring foods.] *Rocz. Państwowego Zakł. Hig.*, 1953, No. 3, 247-257. Russian and English summaries.

2836

HOLMES, A. D., SPELMAN, A. F. and WETHERBEE, R. T. **Effect of storage on butternut squash and its seeds.** *J. Amer. Dietetic Assoc.*, 1954, **30**, 138-141. [Massachusetts Agric. Exp. Stat., Amherst.]

Sixty mature and 60 immature squashes (*Cucurbita moschata*, Duchesne) were stored in the dark for 221 days at an average temperature of 60° F., range 54° to 70° F., and average relative humidity 76 per cent., range 70 to 90 per cent. Water,

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protein, fat, total sugars, starch and carotene were estimated in the edible parts and the seeds on 6 occasions during storage.

Water and protein in the edible parts of both mature and immature squashes remained fairly constant; total sugars and carotene increased and starch decreased during storage. In the seeds, water, total sugars, starch and carotene decreased and protein tended to increase, particularly in immature samples.

The seeds contained about 5 times as much protein as did the edible parts of the same squashes with, in addition, from 31 to 34 per cent. fat, on a dry matter basis.—P. C. Jowsey.

2837

PRUTHI, J. S., TANDON, G. L. and SIDDAPPA, G. S.
Removal of hydrocyanic acid from tender bamboo shoots. *Bull. Central Food Technol. Res. Inst., Mysore*, 1953, **3**, 41–42.

The conventional method of removing HCN from tender bamboo shoots used for food is to soak them in cold water for 18 to 24 hr. This method is not completely effective nor is soaking in brine for 2 hr. Complete removal is attained by steaming for 1 hr. with one change of water.

J. S. Thomson.

2838

DESCHREIDER, A. R. Étude sur la cuisson des aliments dans des ustensiles de cuisine en aluminium. [**Cooking food in aluminium utensils.**] *Chimia*, 1953, **7**, 248–255. [Lab. Central, Minist. Affaires Econ., Brussels.]

Trials with different types of aluminium cooking utensils showed that the amount of Al entering into solution in boiling solutions of NaCl, NaHCO₃, Na₂CO₃ or weak acetic acid depended upon the nature of the salt and the quality of the vessel and amounted in some cases to 20 p.p.m.

When foods including milk were boiled in such vessels the amount of Al entering the food was, with the exception of rhubarb, generally less than that already present in the food. It is considered that care should be taken in the use of aluminium cooking vessels and also in the use of baking powder known to contain Al salts.—D. Harvey.

2839

MEREGALLI, A. Metodo di conservazione dei foraggi. [**Methods for conserving fodder.**] *Riv. Zootec.*, 1953, **26**, 358–359.

2840

FITZGERALD, K. **Fodder conservation in the Kimberleys. 2. Utilising native grasses.** *J. Agric. W. Austral.*, 1953, **2**, 693–697.

2841

BREIREM, K. **Development and use of artificial dehydration of forage crops in Western Europe.** *Proc. Vth Internat. Grassland Congr.*, 1952, **2**, 1746–1752. [Div. Animal Nutrit., Royal Agric. Coll. Norway, Vollebekk.]

2842

LUCIFERO, M. L'insilamento dei foraggi al lume di recenti ricerche compiute negli Stati Uniti. [**Ensilage of forage crops in the light of recent research in the United States.**] *Riv. Zootec.*, 1954, **27**, 6–9.

2843

DUFOUR, L., NIEDERMEIER, R. P., ZEHNER, C. E. and CROWLEY, J. W. **Sulfur dioxide as a preservative for high moisture legume silage.** *J. Dairy Sci.*, 1954, **37**, 52–57. [Dept. Dairy Husb., Univ. Wisconsin, Madison.]

Alfalfa and red clover forage was ensiled with or without SO₂ at a rate of 5.66 lb. per ton in 2 silos holding about 24 tons each. About 6½ months later the silos were opened and the contents were given to 2 groups each of 8 cows. Silage from different depths in the silos was analysed for proximate constituents and carotene.

Both silages were palatable and daily consumption was on the average 65 lb. per cow. Both groups gained weight at similar rates and milk production was similar. The SO₂-treated silage was of significantly lower pH, moisture and fibre and higher in protein than untreated silage. No significant difference between silages was shown for ether extract, ash and carotene.—P. C. Jowsey.

See also Absts. 2925, 2926, 3147.

CULTURE OF MICRO-ORGANISMS FOR FOOD

2844

REISER, C. O. **Food yeast. Torula yeast from potato starch wastes.** *J. Agric. Food Chem.*, 1954, **2**, 70–74. [Dept. Chem. Eng., Univ. Idaho, Moscow.]

A 30-litre laboratory fermenter, which is illustrated, was used to produce food yeast by propagation of *Torulopsis utilis* in waste liquor from a potato starch extraction plant. Batch production

with 10 litres of medium resulted in a solids recovery rate of 45 per cent. Continuous production in which 2.5 litres per hr. were removed and replaced resulted in a solids recovery of over 45 per cent. Full technical details are given.

Larger scale propagations were made with 40-gal. batches of medium in an 80-gal. stainless steel kettle. Solids recovery averaged 40 per cent.

Preliminary designs and flow diagram for a commercial plant are described and costed. A 30-ton starch plant could produce 4.5 tons of yeast daily at a cost of about 5 cents per lb., with a preliminary investment of \$165,000.

The yeast had a protein content of about 55 per cent. and preliminary feeding trials with chicks showed it to have a feeding value equivalent to a mixture of fish, meat and soya bean meals.

P. C. Jowsey.

2. CHEMICAL COMPOSITION OF FOODSTUFFS

(Except Vitamins, for which see Section 3)

ENERGY VALUE, PROXIMATE PRINCIPLES AND INORGANIC CONSTITUENTS

GENERAL

2845

GONGORA Y LOPEZ, J. and LOPEZ, N. Y. Tabla de composicion de alimentos Colombianos. [Table of the composition of Colombian foods.] Inst. Nac. Nutricion, Bogota, 1953, pp. 79.

2846

VINIT, F. and TRÉMOLIÈRES, J. Table abrégée de composition des aliments. [Abridged table of food composition.] *Bull. Inst. nat. Hyg., Paris*, 1954, 9, 108-118. [Sect. Nutrit., Inst. Nat. Hyg., Paris.]

This table, based on the results of earlier work and containing some new values, gives the energy value, proximate constituents and content of Ca, Fe, vitamins A, B₁ and C and riboflavin per 100 g. of 58 typical foods and beverages as purchased and as eaten.—W. M. Deans.

2847

CHAKRAVARTI, R. N. and MAITI, P. C. Analysis of some cooked diets (Bengali). *Indian Med. Gaz.*, 1953, 88, 626-639. [Dept. Chem., Sch. Trop. Med., Calcutta.]

The proximate composition, crude fibre, Ca, P, total and available Fe, NaCl, vitamins B₁, B₂ and A and nicotinic acid were estimated in samples of mung (*Phaseolus mungo*) dal, mushur (*Ervum lens*) dal, curries of potato, papaya, mixed vegetable, fish and mutton, and chutney.—F. C. Aitken.

2848

BIANCHI-CAYAMA, L. Sales marinas venezolanas. Su empleo en la fabricacion de sal yodada. [Venezuelan marine salts. Their use in the preparation of iodised salt.] *Arch. venezol. Nutricion*, 1952, 3, 433-442. [Inst. Nac. Nutricion, Caracas.] English and German summaries.

Estimations were made, mostly by A.O.A.C. methods, of the component ions of 8 samples of sea-salt from different places in Venezuela. I was estimated by a method which is described in detail.

The I content of the salts varied from 0.035 to 0.470 mg. per 100 g. They were considered a poor source of dietary I.—P. C. Jowsey.

2849

Zinc in foods. *Med. Officer*, 1954, 91, 100. Summary of Report of Metallic Contamination. Sub-Committee of Food Standards Committee of Ministry of Food.

See also Abst. 3813.

FOODSTUFFS OF ANIMAL ORIGIN

Milk and Milk Products

2850

HYTTEN, F. E. Clinical and chemical studies in human lactation. 1. Collection of milk samples. 2. Variation in major constituents during a feeding. 3. Diurnal variation in major constituents of milk. 4. Trends in milk composition during course of lactation. 5. Individual differences in composition of milk. *Brit. Med. J.*, 1954, i, 175-176; 176-179; 179-182; 249-253; 253-255. [Dept. Midwifery, Univ. Aberdeen.]

1. In 83 subjects, 7th-day yield of milk obtained by manual expression was less than 6th-day yield obtained by weighing infants and measuring residual milk obtained by manual expression after feeds. In 85 subjects 7th-day yield obtained with the "humalactor" breast pump exceeded 6th-day yield computed from test weighings and measured strippings.

These results suggested that manual expression decreased milk secretion. For this reason and also because of the convenience of mechanical expression in obtaining 24-hr. milk output, the humalactor was used in subsequent studies of milk yield and composition.

2. Consecutive samples of milk obtained during the emptying of a breast in several subjects were analysed for fat, lactose and N. There was a progressive and usually large increase in fat content with a small decrease in lactose. Total N fell from the beginning to the end of the sampling

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during the first few days of lactation, but in later milk there was usually a small increase as the breast was emptied.

It is suggested that the behaviour of the fat is due to adsorption of the fat globules on the large secretory and duct surface of the breast. This view was supported by analysis of samples of milk progressively expressed by compression of a rubber sponge soaked in human milk.

3. Forty-nine 24-hr. samples were collected from 42 women at the usual feeding times of 6 and 10 a.m., 2, 6 and 10 p.m. The yield and composition of milk from women on the 21st day *post partum* and later are shown separately from those results relating to earlier milk.

In both series, yield at 6 a.m. was significantly greater than at other times. In the earlier milk, yield at 10 p.m. was significantly lower than at other times. In both series fat content was lowest at 6 a.m. and highest at 10 a.m. The mean diurnal variation in fat output presented graphically shows that total daily fat output cannot be assessed accurately from the analysis of any single sample.

Possible factors governing the volume of milk obtained at a feeding are considered.

4. Fat, lactose, total N and N.P.N. were estimated in 240 24-hr. samples of milk collected at different stages of lactation from 194 women. Individual variation in milk output was very great. Yield rose rapidly during the first week and then more slowly. Total N and N.P.N., initially high, fell steeply during the first 3 days and then more slowly until the second month or later. Lactose content rose from an initially low level to a stable level within the first month of lactation. Fat content, usually low during the first few days, rose slowly up to the second month. Analyses of serial samples of milk from 4 women indicated that the range of values of lactose and N diminishes after the seventh day, but individual differences in fat content on the 7th day are maintained. Seventh-day fat is, therefore, a good indication of the fat content of mature milk in each individual.

The doubtful significance of the term colostrum is discussed.

5. The results of the analysis of 150 samples of 7th-day milk presented in part 4 were used in this study. There was no statistically significant difference in average volume and composition of milk between 121 primiparae and 29 multiparae. For 6 of the multiparae, volume and fat content of milk in a previous lactation were known. These results showed that the same individual in two lactations may produce milks of widely different fat content.

Statistical analysis of data relating to the 121 primiparae indicate that there is a physiological

upper limit to lactose content and a lower limit to protein content. Lactose tends to be positively related and protein to be negatively related to milk volume. Fat content is independent of all three, and in some milks the fat content is so low that even with a high milk volume energy intake of the infant would be insufficient.

The variability of lactose and protein content is attributed to differences in speed of maturation of the milk. The reason for the wide individual differences in fat content is at present obscure.

F. C. Aitken.

2851

SOUPART, P., MOORE, S. and BIGWOOD, E. J.

Amino acid composition of human milk. *J.*

Biol. Chem., 1954, **206**, 699-704. [Dept.

Biochem. Nutrit., Fac. Med., Univ. Brussels.]

Two samples of pooled milk, collected from 20 and 40 mothers, respectively, in the urban district of Brussels were hydrolysed with acid and the hydrolysate was analysed by ion exchange chromatography on Dowex 50. Tryptophan was estimated microbiologically in an alkaline hydrolysate. The results for 18 amino-acids are expressed as mg. per 100 ml. milk and these, with ammonia, account for 88 per cent. of the total N.—W. Godden.

2852

JANSE, L. C. **The composition of Friesian milk.** 2.

Nederlands Melk Zuiveltijdschr., 1953, **7**, 199-

203. [Lab. "Federation of Co-operative

Dairies in Friesland", Leeuwarden.] Dutch

summary.

Fat, solids-not-fat, total protein, casein and lactose were estimated by methods previously described (Abst. 3261, Vol. 20) in 3258 samples of milk collected during 1952-53.

The results are presented as regression lines for fat/solids-not-fat, fat/total protein, fat/lactose and fat/casein.

With an increase in fat content from 2.7 to 5.7 per cent., the following were correlated: total protein increased by 1.1 per cent., solids-not-fat and casein each increased by 0.9 per cent. and lactose decreased by 0.3 per cent.—P. C. Jowsey.

2853

JASIŃSKA, M. Zależność liczby chlorocukrowej od

właściwości fizyko-chemicznych mleka krów z

te renów Dolnego Śląska. [The chlorine: sugar

ratio and its relation to the physicochemical

properties of milk.] *Rocz. Państwowego Zakł.*

Hig., 1953, No. 4, 481-486. [Stac. Sanit.

Epidemiol., Wrocław.] Russian and French

summaries.

2854

WHITTLESTONE, W. G. **The physical properties of**

cow's milk as influenced by stage of lactation.

The size distribution of butterfat globules. *J. Dairy Res.*, 1954, **21**, 50-54. [Ruakura Animal Res. Stat., N.Z. Dept. Agric.]

With the method previously devised for cows (Abst. 1714, Vol. 22), samples of milk drawn sequentially by machine from one quarter of one cow's udder were examined at different stages in a lactation. There was no obvious trend in the size of fat globules as between middle milk and strippings, as between morning and evening milks, or with stage of lactation. The increase in the fat content of strippings cannot be explained as due to the filtering out of large globules or to creaming effects due to the rise of large globules.—W. Godden.

2855

VAN MIDDLESWORTH, L., TUTTLE, A. H. and THRELKELD, A. **Iodinated protein in milk.** *Science*, 1953, **118**, 749. [Dept. Physiol., Univ. Tennessee, Memphis.]

Samples of milk collected 4 and 24 hr. after the injection of 2.5 or 8 mC. of ^{131}I into 2 lactating bitches were analysed and studied by paper electrophoresis. The non-dialysable ^{131}I was associated mainly with the slow-moving protein but was present in all protein fractions separated. After hydrolysis the presence of 2 radio-active substances was demonstrated chromatographically.

From these findings and those of earlier work (Abst. 294, Vol. 22) it was concluded that milk contains an iodinated protein and that purified casein possesses a thyroid-like property of goitre prevention.—D. Harvey.

2856

JENNESS, R. **Milk proteins. Effects of heat treatment on serum proteins.** *J. Agric. Food Chem.*, 1954, **2**, 75-81. [Dept. Agric. Biochem., Univ. Minnesota, St. Paul.]

A lecture review.

2857

ZELTER, Z. **Travaux biochimiques et biophysiques récents sur la structure et la constitution des caséines. [Recent biochemical and biophysical work on the structure and constitution of caseins.]** *Lait*, 1953, **33**, 594-610.

2858

KUHN, R. and BROSSMER, R. (with SCHULZ, W.) **Über die prosthetische Gruppe der Mucoproteine des Kuh-Colostrums. [On the prosthetic group of mucoproteins of cow's colostrum.]** *Chem. Ber.*, 1954, **87**, 123-127. [Max-Planck-Inst. Med. Forsch., Heidelberg.]

2859

WILKOWSKE, H. H. **Relationship between titratable acidity and pH during lactic acid fermenta-**

tation in reconstituted nonfat milk. *J. Dairy Sci.*, 1954, **37**, 22-29. [Dept. Dairy Sci., Florida Agric. Exp. Stat., Gainesville.]

2860

KHERASKOV, S. **Moloko verbludits i produkty ego pererabotki. [Camel's milk and products made from it.]** *Mol. Prom.*, 1953, **14**, No. 10, 36. [Chkalov S Sel'khoz. Inst.]

Camel's milk is white and contains more fat and lactose than cow's milk. The following values are given for camels with one and two humps, respectively: fat 4.47, 5.39 g. per 100 ml.; total protein 3.5, 3.8 per cent.; lactose 4.95, 5.2 per cent.; ash 0.70, 0.69 per cent.; acid number 15.5, 16.6; density 1.0305, 1.0320. Cheese made from camel's milk is solid but of floury consistency, and has a distinctive taste. Camel's milk is mixed with cow's or ewe's milk for making cheese which is highly prized in the Turkmenian and Kazakhstan republics. "Shubat", which resembles koumiss, is used as an appetiser and a remedy for tuberculosis and anaemia.—W. Hughes.

2861

JANKOWSKI, Z. **Badania nad składem chemicznym mleka owczego i zętycy. [Chemical composition of ewe's milk and whey.]** *Rocz. Państwowego Zakł. Hig.*, 1953, No. 4, 459-471. [Stac. Sanit.-Epidemiol., Zakopane.] Russian and French summaries.

Ewe's milk from the Jaworzynka valley was similar in composition to that reported from other European countries. Samples taken during the season showed a progressive rise in fat content.

Whey is consumed chiefly by shepherds and its nutritive value is high. The sugar and fat contents are about the same as those of milk but the nitrogen content is much lower. (From summary.) J. S. Thomson.

2862

PERRIN, D. R. **The composition of sow's milk during the course of lactation.** *J. Dairy Res.*, 1954, **21**, 55-62. [Ruakura Animal Res. Stat., N.Z. Dept. Agric.]

Milk from 44 sows, mostly Berkshires, sampled through 68 lactations was analysed at weekly intervals from the 7th day to the end of lactation and data for total solids, fat, solids-not-fat, protein, lactose and ash are presented in detail. The milk was obtained by machine-milking after intravenous injection of oxytocin.

Mean values for some constituents, based on the analysis of over 450 samples taken from the 7th to the 56th day of lactation were: fat 9.58, protein 6.11, lactose 4.62, ash 0.92 per cent., but the variation was great. Some data on day-to-day variations are given also.

In general fat rose for 3 weeks and fell steadily over the rest of the lactation. Protein fell rapidly in the first week from about 17 per cent. and then more slowly to about the 16th day. It then rose steadily to about 7 per cent. at the end of lactation. Lactose remained steady for 2 weeks, then fell slowly for the rest of the period. Total solids rose for 3 weeks and then fell slowly thereafter, and ash tended to rise steadily throughout lactation. For all constituents the 3rd week of lactation seemed to be a critical period when the trend was set for the remainder of the lactation.

P. C. Jowsey.

2863

PERRIN, D. R. **The estimation of the energy of sows' milk from fat and total solids content.** *J. Dairy Res.*, 1954, **21**, 63-66. [Ruakura Animal Res. Stat., N.Z. Dept. Agric.]

It has been shown (preceding Abst.) from a study of the chemical composition of the milk of 44 sows over 68 lactations that the ash and lactose content of sow's milk show well-defined trends during the course of a lactation and do not change significantly with varying dietary levels. With these data and applying Anderson's values (*Nord. Jordbrugsforsk.*, 1926, **4**, 133) for the energy value of fat, protein and lactose it is possible to calculate the energy value of sow's milk on an estimated composition requiring only the estimation of percentages of fat and total solids for its calculation.—W. Godden.

2864

KOLOUŠEK, J. and MICHALÍK, S. **Studium aminokyselin v sýrech pomocí rozdělovací chromatografie na papíře. [Study of the amino-acids in cheese by means of paper partition chromatography.]** *Sborn. čsl. Akad. Zéměd.*, 1954, **27**, 67-78. [Lab. Agrobiochem., Vysocké Školy, Prague.] Russian and English summaries.

The free amino-acids of different cheeses differed both qualitatively and quantitatively; changes due to proteolysis occurred during the ripening of one particular type of cheese. The amino-acid composition of cheese protein did not change qualitatively during ripening.

Roquefort, Emmental and Moravian bochník cheeses contain all the essential amino-acids.

The paper chromatographic method of analysis described [in Czech] is recommended for the routine control of cheesemaking. (From summary.)

P. C. Jowsey.

2865

DACRE, J. C. **Amino-acids in New Zealand Cheddar cheese: their possible contribution to flavour.** *J. Sci. Food Agric.*, 1953, **4**, 604-608. [Dairy Res. Inst. (N.Z.), Palmerston North.]

Fifteen amino-acids were identified in the water-soluble N fraction of the cheese. The relative con-

centrations of the amino-acids were deduced by visual appraisal of the colours produced with ninhydrin on paper chromatograms prepared at intervals during the storage of the cheese up to 6 months.

All the amino-acids except tyrosine increased in amount as the cheese matured. Tyrosine concentration fluctuated, owing probably to the decarboxylating activity of the lactobacilli present in the cheese. No correlation between the time of appearance of a particular amino-acid and the development of Cheddar cheese flavour was apparent, nor did single or mixed amino-acids or their corresponding amines have any smell or taste resembling such a flavour.—P. C. Jowsey.

2866

OHTA, K., WATARAI, T., OISHI, T., UESHIBA, Y., HIROSE, S., YOSHIZAWA, T., AKIKUSA, Y., SATO, M. and OKANO, H. **Composition of fin whale milk.** *Proc. Japan Acad.*, 1953, **29**, 392-398. [Dept. Paediat., Dent. Med. Univ., Tokyo.]

Two samples of fin whale milk refrigerated for 2 and 13 months were examined. Both were viscous and creamy, with a flavour like cod liver oil. The solids amounted to 4 times those of human or cow's milk and the protein to 8 times that of human and 4 times that of cow's milk. The distribution of protein components and amino-acids resembled that in human milk. The fat content was over 30 per cent. and the fat globules were large. The lactose contents were 0.2 and 0.3 per cent. The Ca and P contents resembled those of cow's milk, and carotenoids, vitamin B₁ and riboflavin were present. The milks had high acidity, which may have been due to fatty decomposition during the long storage.—A. M. Copping.

Eggs

2867

MACDONNELL, L. R., DUCAY, E. D., SUGIHARA, T. F. and FEENEY, R. E. **Proteins of chicken, duck, and turkey egg white.** *Biochem. biophys. Acta*, 1954, **13**, 140-141. [W. Reg. Res. Lab., Bur. Agric. Indust. Chem., Albany, Calif.]

The white of eggs from chicken, turkey, Pekin duck and mallard contained, respectively: lysozyme 3.4, 1.84, 0.94, 0.86; conalbumin 12.0, 11.0, 2.8, 2.9; ovomucoid 11, 11, 15, 15; cysteine (in native protein) 0.46, 0.42, 0.32, 0.28; (in denatured protein) 0.62, 0.47, 0.37, 0.29 per cent. on a dry matter basis.—P. C. Jowsey.

Meat (all kinds)

2868

CHAVEZ VALDIVIA, A. **Contribución al estudio bromatológico de la carne de ballena. [Bromatological study of whalemeat.]** *An. Fac.*

Farm. Bioquim., Lima, 1952, 3, 94-98. [Lab. Bromatol., Univ. Lima.]

The meat of *Balaenoptera physalus* had the following composition on a fresh basis: water 59.2, dry matter 40.8, fat 8.7, total protein 26.6, digestible protein 24.5, ash 4.9 per cent.; vitamin A 212.5 I.U. per g. fat; energy value 189.3 Cal. per 100 g. The ash contained P 0.21, Ca 0.018, Fe 0.0031 g. per 100 g.—P. C. Jowsey.

2869

REITH, J. F. and HOFSTEEDE, M. J. N. The meat content of brined and sterilised sausages. *Analyst, 1954, 79, 107-108. [Dept. Food Chem., Univ. Utrecht, Catharijnesingel 60.]*

Fish

2870

SHEWAN, J. M. The nitrogenous extractives from fresh fish muscle. 2. Comparison of several gadoid and elasmobranch species. *J. Sci. Food Agric., 1953, 4, 565-568. [D.S.I.R., Torry Res. Stat., Aberdeen.]*

Aqueous-ethanolic extracts of muscle of 9 gadoids and 3 elasmobranchs caught in the North Sea were studied by the methods described in the first paper of this series (Abst. 194, Vol. 23).

Qualitative analysis showed the presence of 13 amino-acids and creatine, creatinine, trimethylamine oxide and possibly glutathione in all species examined. Betaine and sarcosine were found in elasmobranchs only; anserine and methylhistidine in gadoids only.

Samples from species within a group were closely similar, but there were wide differences between the 2 groups.—P. C. Jowsey.

2871

AREVALO PADILLA, R. Estudio químico bromatológico de la carne del "*Acanthistius pictus*" o Cherlo. [Chemical and bromatological study of the flesh of *Acanthistius pictus*.] *An. Fac. Farm. Bioquim., Lima, 1952, 3, 160-163. [Lab. Bromatol., Univ. Lima.]*

The flesh of the fish *Acanthistius pictus* had the following percentage composition on a fresh basis: water 76.2, dry matter 23.8, protein 18.75, digestible protein 16.96, fat 3.06, carbohydrates 0.0052, total ash 1.53, Ca 0.131, Fe 0.0006, Cu 0.0004, P 0.114, Cl 0.16, Na, K and I traces, tyrosine 0.724, tryptophan 0.050. Vitamin A averaged 9250 I.U. per g. fat; the energy value was 103 Cal. per 100 g.

P. C. Jowsey.

2872

CASTILLO LA ROSA SANCHEZ, I. Estudio bromatológico de la carne de "*Anisotremus scapularis*" o "Chita". [Bromatological study of the flesh of *Anisotremus scapularis*, the sea bream.]

An. Fac. Farm. Bioquim., Lima, 1952, 3, 136-140. [Lab. Bromatol., Univ. Lima.]

The flesh had the following percentage composition on a dry matter basis: total protein 78.1, digestible protein 70.9, fat 16.5, total ash 5.0; vitamin A averaged 11,400 I.U. per g. fat; the energy value was 461 Cal. per 100 g. The following minerals were present: Ca 0.27, P 0.53, Fe 0.0029, Cl 0.31 g. per 100 g. dry matter, I a trace. Tyrosine and tryptophan amounted to 1.83 and 1.09 per cent., respectively.—P. C. Jowsey.

2873

COSTA SAENZ, F. Estudio bromatológico del "*Ethmidium chilcae*" o "Machete". [Bromatological study of *Ethmidium chilcae*.] *An. Fac. Farm. Bioquim., Lima, 1952, 3, 150-154. [Lab. Bromatol., Univ. Lima.]*

Analysis of the flesh of *Ethmidium chilcae* gave the following values per cent. in fresh material: moisture 72.08, fat 6.14, total protein 19.54, digestible protein 16.45, and total ash 1.442; Ca 0.186, P 0.103, Cl 0.056, Fe 0.003, traces of I and Cu; energy value 133 Cal. per 100 g. In the flesh there were 13,712 I.U. vitamin A, and in the liver 16,875 I.U. each per g. fat. Tyrosine formed 0.611 and tryptophan 0.149 per cent. of the total protein. This fish is recommended for consumption because of its abundance and low cost, and the biological value of its protein.—M. B. Richards.

2874

VALLEJOS PLANTANO, C. Análisis bromatológico de la carne de "*Paralanchurus peruanus*", "Coco" o "Suco". [Bromatological analysis of the flesh of *Paralanchurus peruanus*.] *An. Fac. Farm. Bioquim., Lima, 1952, 3, 155-159. [Lab. Bromatol., Univ. Lima.]*

Analysis of the flesh of *Paralanchurus peruanus* gave the following values, in g. per 100 g. fresh material: moisture 81.17, fat 1.40, total protein 15.76, digestible protein 12.06, total ash 1.19; Ca 0.109, P 0.209, Fe 0.0012, Cl 0.0852, I 0.0119, and traces of Cu; carbohydrates 0.0035; energy value 76 Cal. per 100 g.; vitamin A 7000 I.U. per g. fat; tyrosine 0.527 and tryptophan 0.085 g. per cent.—M. B. Richards.

2875

GARCIA TERRY, O. E. Valoración de los aminoácidos azufrados: cistina, cisteína y metionina en peces. [Estimation of sulphur amino-acids (cystine, cysteine and methionine) in fish.] *An. Fac. Farm. Bioquim., Lima, 1952, 3, 99-115. [Lab. Dept. Municip. Sanidad, Lima.]*

Methionine, cystine and cysteine were estimated in the protein of 3 species of fish: *Thunnus macropterus*, *Mustelus mento*, and *Ethmidium chilcae*. For 10 samples of each species, in the

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above order, the averages, in g. per 100 g. pure protein, were: methionine 3.7, 3.6, 3.9; cystine 1.9, 1.8, 1.9; cysteine 0.44, 0.39, 0.47. The results are close to those given by Block and Bolling. The Sullivan and McCarthy method was used for the estimation of methionine, and the Folin technique as modified by Block and Bolling for cystine and cysteine. The work includes a study of some of the conditions which influence the hydrolysis and the colorimetric reactions.

M. B. Richards.

Other Types

2876

DE LA TORRE A., M.C. *Valuación de metionina, cistina y cisteína en algunos crustáceos consumidos en el Perú. [Estimation of methionine, cystine and cysteine in some crustaceans eaten in Peru.] An. Fac. Farm. Bioquím., Lima, 1952, 3, 141-149. [Lab. Control, Inst. Sanitas, Lima.]*

Methionine, cystine and cysteine were estimated in 4 species of Crustacea from the Peruvian coast, *Bithynis caementarius*, *Cancer polyodon*, *Panulirus ornatus*, and *Penaeus stylirostris*. For 5 samples of each species in the order given, the averages in g. per 100 g. pure protein were: methionine 2.41, 3.17, 2.40, 2.20; cystine 1.63, 1.93, 2.76, 1.66; cysteine 0.27, 0.68, 0.65, 0.52. The results are also given as percentages in the fresh and dried samples.—M. B. Richards.

2877

BLOSSER, T. H., ABBITT, W. H., SHAW, A. O., ASHWORTH, U. S. and SMITH, E. P. *The composition of foreign and domestic bone meals used in livestock feeding. J. Animal Sci., 1954, 13, 152-159. [Washington Agric. Exp. Stat., Pullman.]*

Twenty-two samples of bonemeal, 14 of foreign and 8 of domestic [U.S.] origin, were analysed. Four appeared to be contaminated, possibly with raw rock phosphate. Omitting these, the average composition was: protein 7.59, ether extract 0.93, ash 81.09, Ca 31.70, P 13.73, Mg 0.64 and S 0.22 per cent. Average contents of other elements estimated spectrographically were: Al 2344, Ba 361, Cu 16, F 803, Fe 964, Mn 49, Na 5000, Sr 2433, and Zn 489 p.p.m. of rehydrated ash. In addition, B, Cr, Mo, Si, Ag, Ti and V were found in one or more samples.—P. C. Jowsey.

FOODSTUFFS OF VEGETABLE ORIGIN

General

2878

MAGGIOLO FIGARI, F. *Valoración del ácido glutámico en alimentos. [Estimation of glutamic acid in foods.] An. Fac. Farm. Bioquím.,*

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Lima, 1952, 3, 125-131. [Lab. Bromatol., Univ. Lima.]

Estimations of glutamic acid were made on plant products by the method of Orthner and Reichel (Practicas Quím. Org., 1943). For substances analysed in the fresh state the values obtained, per cent., were: artichoke 0.835, olive 0.744, beetroot 0.667, celery 0.6655, egg-plant 0.625, carrot 0.603, and turnip 0.4275. Dried apricot and dried peach contained, respectively, 1.883 and 1.127 per cent.—M. B. Richards.

2879

JANES, B. E. *Composition of Florida-grown vegetables. 3. Effects of location, season, fertilizer level and soil moisture on the mineral composition of cabbage, beans, collards, broccoli and carrots. Florida Agric. Exp. Stat. Bull. No. 488, December 1951, pp. 32.*

Two varieties of cabbage, 2 of beans [species not stated], 1 of broccoli, 1 of collards and 2 of carrots were grown at several stations and received fertiliser at 3 levels as previously described (Abst. 4819, Vol. 20). Total and dry matter yields, Ca, Mg, K, Na, Mn, Fe, S and P were estimated in all samples and the data are given in detail. Soil samples were analysed also.

The largest differences in mineral composition were associated with type of crop and location. Fertiliser level had only a slight effect.

To investigate further the effect of soil conditions, 2 varieties of beans and 1 of cabbage were grown on plots receiving irrigation water in 3 treatments; light, heavy and heavy in 2 equal applications. The control plot was not irrigated. Irrigation affected the mineral composition of the fresh vegetables; those heavily irrigated had reduced amounts of minerals, but on a dry matter basis there was, with minor exceptions, little difference.

In general, Ca, Mn and Fe contents were related to the physical and chemical characteristics of the soil; Na was influenced by the amount added to the soil, and Mn and Fe were affected by soil acidity. P in the vegetables was not correlated with the acid-soluble P in soil.—P. C. Jowsey.

Cereals

2880

CHAMBERS, W. E. *Nutrient composition of the produce of the Broadbalk continuous wheat experiment. 1. Changes over seventy years. 2. Changes occurring during one season's growth. J. Agric. Sci., 1953, 43, 473-478; 479-484. [Rothamsted Exp. Stat., Harpenden, Herts.]*

1. The changes in yield, K, Ca, Mg and Na over a 70-year period are described in detail and data for grain and straw showing the mean values and

the mean changes per decade are presented for 9 fertiliser treatments.

A method of estimating minerals by the Lunde-gårdh flame method of spectrography is described; it compares favourably in accuracy with gravimetric analysis.

2. K, Ca, Mg and Na were estimated spectrographically in ears, stems and roots of wheat from 8 Broadbalk plots which had received different fertiliser treatments. Samples were taken at 3-weekly intervals from May to early August 1945.

On all plots the concentrations of nutrients in all parts of the plants decreased during growth. Fertiliser treatment affected the composition of all parts except the ears. The data are given in detail.—P. C. Jowsey.

Legumes

2881

CURINI GALLETI, A. Bersim. Trifoglio alessandrino, o egiziano (*Trifolium Alexandrinum* L.). [Berseem. Alexandrine or Egyptian clover (*Trifolium alexandrinum*, L.).] *Riv. Zootec.*, 1954, 27, 14.

A description of the plant, its feeding value and composition. It is resistant to drought, responds readily to fertilisers, and is slightly richer in nutrients than red clover.—T. D. Bell.

2882

HOLMES, P. The amino-acid composition of certain seed proteins. *Austral. J. Exp. Biol. Med. Sci.*, 1953, 31, 595–602. [Inst. Agric., Univ. W. Australia.]

In extension of earlier work (Abst. 3262, Vol. 21) 15 amino-acids were estimated in the acid hydrolysates (alkaline for tryptophan) of the "whole" proteins from legume seeds and other materials previously analysed for arginine. The amino-acids were separated by paper chromatography, the methods used being based on the work of Consden *et al.* (*Biochem. J.*, 1944, 38, 224). A preliminary investigation showed considerable losses of amino-acids during hydrolysis, amounting, for individual acids, to from 4.6 to 37.6 per cent. The final results were corrected for these losses. Compared with whole egg protein as standard, the amino-acids limiting the nutritive value of the seed proteins were methionine in lupin seeds; methionine and isoleucine in vetch seeds; methionine, isoleucine and valine in peas; isoleucine, threonine and methionine in subterranean clover seed; and isoleucine and methionine in linseed. There appears to be a general deficiency of isoleucine in legume seeds.—W. Godden.

2883

HOPKINS, C. Y. and CHISHOLM, M. J. Some fatty acids of peanut, hickory, and acorn oils.

Canad. J. Chem., 1953, 31, 1173–1180. [Div. Pure Chem., Nat. Res. Council, Ottawa.]

Groundnut (*Arachis hypogaea*, L., var. Spanish) oil contained the following fatty acids expressed as percentages of the total fatty acids: arachidic 1.5, behenic 3.4, 11-eicosenoic 1.6, docosenoic 0.2. Hexadecenoic acid was not detected. Hickory (*Carya cordiformis*, Koch) nut oil contained the following acids: palmitic 6, stearic 1, higher saturated acids 0.5, oleic 72, linoleic 19. Higher monoenoic acids could not be identified. Acorn (*Quercus alba*, L.) oil contained the following acids: palmitic 10, stearic 2, oleic 48, linoleic and other polyenoic 40; eicosenoic acid was not detected.

W. Godden.

Fruits

2884

ANET, E. F. L. J. and REYNOLDS, T. M. Isolation of *l*-quinic acid from the peach fruit. *Nature*, 1953, 172, 1188–1189. [Div. Food Preservation and Transport, C.S.I.R.O., Homebush, N.S.W.]

2885

LUH, B. S., LEONARD, S. and DEMPSEY, W. Pectic substances of Pearson and San Marzano tomatoes. *Food Res.*, 1954, 19, 146–153. [Dept. Food Technol., Univ. California, Davis.]

2886

PIĄTKOWSKA, K. and SMRECZYŃSKA, A. Oznaczenie zawartości kwasu cytrynowego w surowym soku jeżynowym oraz w winie otrzymanym przez jego fermentację. [Estimation of citric acid in blackberry juice and in the wine obtained by fermentation.] *Rocz. Państwowego Zakł. Hig.*, 1953, No. 4, 493–496. [Stac. Sanit.-Epidemiol., Cracow.] Russian and French summaries.

2887

PIĄTKOWSKA, K. and SMRECZYŃSKA, A. Oznaczenie manganu w surowych sokach malinowych z różnych okolic kraju. [Estimation of manganese in crude raspberry juice from various districts.] *Rocz. Państwowego Zakł. Hig.*, 1953, No. 4, 497–501. [Stac. Sanit.-Epidemiol., Cracow.] Russian and English summaries.

The Mn content of crude raspberry juice varied from 3.6 to 70 mg. per litre and the variation was related to the Mn content of the soil. (From summary.)—J. S. Thomson.

2888

SZCZEPAŃSKI, L. and POMORSKA, Z. Skład chemiczny fermentowanych soków owocowych (win owocowych) z owoców Dolnego Śląska.

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[Chemical composition of fermented fruit juices (fruit wines).] *Rocz. Państwowego Zakł. Hig.*, 1953, No. 3, 271-282. [Stac. Sanit.-Epidemiol., Wrocław.] Russian and French summaries.

2889

RICE, A. C. and PEDERSON, C. S. **Chromatographic analysis of organic acids in canned tomato juice, including the identification of pyrrolidonecarboxylic acid.** *Food Res.*, 1954, **19**, 106-114. [New York State Agric. Exp. Stat., Cornell Univ., Geneva.]

The organic acids in 9 samples of 2-year-old canned tomato juice were estimated chromatographically. The average total acidity was 0.521 per cent.; of this 64.7 per cent. was citric acid, 4.5 per cent. malic acid and 30.1 per cent. pyrrolidonecarboxylic acid, with traces of acetic and lactic acids in some samples. Pyrrolidonecarboxylic acid was not present in freshly prepared tomato juice. Its presence was due to changes during processing and storage.—W. Godden.

2890

ANDRZEJOWICZ, A. and AULICH, K. **Badanie i ocena chemiczna zagęszczonych przetworów pomidorowych. [Chemical analyses and assessment of tomato conserves.]** *Rocz. Państwowego Zakł. Hig.*, 1953, No. 4, 487-492. [Stac. Sanit.-Epidemiol., Bydgoszczy.] Russian and French summaries.

Other Types

2891

FRÖLICH, A. **Experiments with different treatments of rape seed meal. 1. Review of literature and preliminary findings.** *Kgl. Lantbrukshögsk. Ann.*, 1953, **20**, 105-116. [Nat. Animal Exp. Stat.]

The literature is briefly reviewed. Several methods of removing the toxic principle(s) from rapeseed meal were used, including extraction with water or ethanol; fermenting with or without subsequent ether extraction; heating to 100° or 150° C. for 24 and 5 hr., respectively. The different samples were given to groups of 5-week-old Single Comb White Leghorn cockerels for 3 weeks at a level of 10 per cent. of the basic feed. At the end of the test 4 birds from each group were killed and their thyroids were examined.

The results indicated that rapeseed meal does not contain glucoside-splitting enzymes. Cold water and 70 per cent. aqueous ethanol were equally effective in removing mustard oil and some of the thioxazolidone. Dry heating above 130° C. destroyed either the toxic principles themselves or the ability of the glucosides to split into toxic substances.—P. C. Jowsey.

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2892

FERNANDEZ F., Y. **Estudio químico bromatológico del aceite de "Sapindus saponaria" (boliche). [Chemical and bromatological study of the oil of Sapindus saponaria.]** *An. Fac. Farm. Bioquím., Lima*, 1952, **3**, 122-124. [Lab. Bromatol., Univ. Lima.]

Oil was extracted from the ground seeds of *Sapindus saponaria* by a solvent process; a yield of 35 per cent. was obtained. The oil was viscous and golden yellow and had an agreeable taste.

Data are presented for its chemical and physical characteristics. Total fatty acids varied between 85 and 90 per cent.; solid and liquid fatty acids amounted to 23 to 24 and 70 to 74 per cent., respectively. Stearic, oleic and palmitic acids amounted to 4 to 6, 40 to 46 and 12 to 14 per cent., respectively.

The tree occurs in large numbers in Peru, and it may prove economical to collect the seeds for industrial extraction and subsequent processing for a variety of purposes.—P. C. Jowsey.

2893

MONTGOMERY, E. M. and WEAKLEY, F. B. **Carbohydrate composition of hydrol.** *J. Assoc. Off. Agric. Chem.*, 1953, **36**, 1096-1108. [Res. Lab., U.S. Dept. Agric., Peoria 5, Ill.]

Hydrol is a carbohydrate-rich, molasses-like syrup obtained as a by-product in the manufacture of industrial maize sugars. It is used in making silage and in stock feeds. Analyses of 2 samples showed them to contain, per cent., water 26.0, 25.5; protein 0.2, 0.2; ash 8.8, 9.6; dextrose 40.8, 40.9; disaccharides 19.0, 19.0; higher oligosaccharides 5.3, 4.9.—W. Godden.

Pasture, Hay and Silage

2894

SYNGE, R. L. M. and WOOD, J. C. **Diffusible peptide-like and glycosidic constituents of Italian rye grass.** *Biochem. J.*, 1954, **56**, xix. [Rowett Res. Inst., Bucksburn, Aberdeen-shire.]

2895

NATH, N. and DAS, N. B. **Effect of monthly cuts on the chemical composition of some indigenous grasses of India.** *Indian J. Vet. Sci.*, 1953, **23**, 185-204. [Indian Agric. Res. Inst., New Delhi.]

Detailed results are presented for the composition of 10 species of indigenous grasses sampled monthly for 6 months (7 cuts) from May 1949.

P. C. Jowsey.

2896

DOUGALL, B. M. **The composition of *Agrostis setacea*, the bristle-leaved or heath bent grass.**

J. Sci. Food Agric., 1954, **5**, 132-134. [Seale-Hayne Agric. Coll., Newton Abbot, Devon.]

Data are presented for the composition of *Agrostis setacea* sampled 6 times between March and November 1950.

The results indicated that the species is late-maturing and reaches its maximum crude protein content, 11.38 per cent. of the dry matter, in July. The highest digestibility coefficient for crude protein was 69.80 and was obtained in June. The ash was low in Ca and P; the maximum values for CaO and P₂O₅ were 0.175 and 0.291 per cent. of the dry matter, respectively, and were found in July.

It was concluded that *A. setacea* is a poor source of digestible protein and minerals and is of value for only a comparatively short season, chiefly to sheep, since cattle found it unpalatable.

P. C. Jowsey.

2897

DOUGALL, B. M. **The composition and probable feeding value of *Triodia decumbens*.** *J. Sci. Food Agric.*, 1954, **5**, 134-136. [Seale-Hayne Agric. Coll., Newton Abbot, Devon.]

Samples of *Triodia decumbens* were collected on 6 occasions from March to November 1950. Data on composition are presented in detail. Crude protein reached a maximum of 10.88 per cent. of the dry matter in May and the digestibility of this constituent reached its highest value, 72.51 per cent., in the same month. Ca and P were comparatively low at all times.

It was concluded that although the grass is inferior to several other hill species it is of some value to sheep, if only because it is available at a time of general scarcity.—P. C. Jowsey.

2898

DOUGALL, H. W. **Kikuyu grass. 1. Seasonal variation in composition of degenerate and productive pastures.** *East African Agric. J.*, 1953, **19**, 74-80. [Dept. Agric., Kenya.]

Crude protein, crude fibre, carbohydrate, carotene, P₂O₅ and CaO were estimated in samples of Kikuyu grass (*Pennisetum clandestinum*) collected at intervals over 12 months from a young pasture and for 6 months from a 7-year-old pasture. The results are given in detail and data for naturally growing, "wild", Kikuyu grass are given for comparison.

Crude protein was consistently higher and crude fibre generally lower in the young than in the old grass. In June only was the protein content of young pasture herbage lower than that of the wild grass.

Old, unproductive Kikuyu pastures generally have a thick mat of roots and undecomposed plant debris over the soil surface and the first step in regenerating such areas is to rip away and break

up this mat. Work is continuing to estimate the effect of fertilisers on regenerated old Kikuyu pasture.—P. C. Jowsey.

2899

WALKER, T. W., ADAMS, A. F. R. and ORCHISTON, H. D. **The use of fertilizers on herbage cut for conservation. 4. The effect of rates, methods of application and forms of fertilizer nitrogen on the yields of dry matter and nitrogen of grasses and clovers in a ryegrass and white clover sward, cut at different stages of growth.** *J. Brit. Grassland Soc.*, 1953, **8**, 281-299. [Canterbury Agric. Coll., New Zealand.]

For previous parts see Absts. 1470, 2816, 4083, Vol. 23.

A 3 × 3 × 3 factorial trial of single replication was laid down on a ryegrass-white clover sward to test 3 sources of N, urea (40 per cent. N), nitrolime (20.5 per cent. N) and sulphate of ammonia (20.7 per cent. N), applied at 2 rates, 0.3 and 0.6 cwt. N per acre, with a control, untreated plot, with 3 types of cutting, for dried grass (4 cwt.), for silage (3 cwt.) and for hay (2 cwt.). A secondary trial contrasted 2.4 cwt. N per acre as urea applied in 1 massive or in 4 equal dressings. This herbage was cut 5 times for dried grass. Yields of fresh and dry matter and N were estimated for each cut. The trial lasted about 170 days.

The results are presented and analysed in detail. Ammonia depressed the yield of clover more than the other forms of N used and although it appeared to increase the yields of dry matter and N in the grasses more than the other fertilisers, the differences were not significant.

It is suggested that urea would probably be the best and cheapest form of N to import into New Zealand for special purposes such as out-of-season production of grazing on ryegrass.

It was concluded that there is little to be gained in yield of either dry matter or crude protein from the use of moderate amounts of N fertiliser on swards containing a high proportion of clovers cut for conservation in any form.—P. C. Jowsey.

2900

ØDELIEN, M. **The effect of fertilizer rates on the sugar content of timothy.** *Acta Agric. scand.*, 1954, **4**, 67-70. [Inst. Fertilization and Soil Management, Agric. Coll. Norway.]

Sucrose and reducing sugars expressed as glucose were estimated in samples of timothy collected immediately before each of 2 hay cuts during the years 1949 to 1952 inclusive from fields that had received different amounts of Fullgjödsel A (N 13.5, P 6.0, K 16.0 per cent.), K fertiliser (K 33 per cent.) and, after the first cut, nitrate of lime.

The sucrose contents fell in all first-cut samples as the amount of fertiliser increased. From no dressing to the heaviest (900 kg. Fullgjödsel A plus 225 kg. K fertiliser per hectare) the relative amounts of sucrose present were 100, 67, 48, 45 per cent. No definite trend for the second cut was noted. No clear connection between fertiliser level and glucose content was established for either cut.—P. C. Jowsey.

2901

HILDER, E. J. **Some aspects of sulphur as a nutrient for pastures in New England soils.** *Austral. J. Agric. Res.*, 1954, **5**, 39–54. [Div. Plant Indust., C.S.I.R.O., Reg. Pastoral Lab., Armidale, N.S.W.]

The beneficial effects of S fertilisers on the yield of subterranean clover growing on S-deficient soils in the New England region of New South Wales were studied. Detailed results are given.

P. C. Jowsey.

2902

SEARS, P. D., LAMBERT, J. P. and THURSTON, W. G. **Pasture growth and soil fertility. 6. Influence of red and white clovers, superphosphate, lime, and sheep grazing, on pasture yields and composition, and on the growth of subsequent forage crops; results at Gore and Lincoln.**

SEARS, P. D. **7. General discussion of the experimental results, and of their application to farming practice in New Zealand.** *N.Z. J. Sci. Technol.* [A], 1953, **35**, 199–220; 221–236. [Grasslands Div., D.S.I.R., Palmerston North, N.Z.]

6. The trials made at Gore and Lincoln were similar to previous trials at Palmerston North (Abst. 1680, Vol. 24).

The results showed that the same general improvement resulted from the presence of clovers and the return of dung and urine, but differences due to climate and level of soil nutrients occurred.

At both Gore and Lincoln, response to superphosphate and lime was greater than at Palmerston North. Pedigree New Zealand white clover was more effective in increasing soil N than Pedigree red clover, but the results were not conclusive, since no trial to test the effectiveness of the associated *Rhizobia* were made, nor any to test the effectiveness of nutrients other than lime and P. Yields of forage crops grown after the pasture trials were correlated with the preceding pasture yields as previously found.

The evidence emphasised the need for increasing the soil nutrients, especially N, in order to attain the yields that are possible under New Zealand climatic conditions.

7. The data presented in the 6 preceding reports are discussed in relation to the basic concept of

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pasture growth and soil fertility increase in New Zealand and to some particular aspects of farming practice.—P. C. Jowsey.

2903

ANDREWS, E. D. **Effectiveness of cobalt sulphate applied to cobalt-deficient pumice land from the air.** *N.Z. J. Sci. Technol.* [A], 1953, **35**, 301–310. [Animal Res. Stat., Dept. Agric., Wallaceville.]

A pasture of varied topography, the herbage of which contained on the average 0.05 p.p.m. Co on a dry matter basis was top-dressed from the air with a solution of cobalt sulphate at the rate of 20 oz. of the hydrated salt per acre.

The average Co content of the herbage was raised to 0.98 p.p.m. immediately after top-dressing. A year later it was 0.13 and a further year later 0.10 p.p.m. on a dry basis.

P. C. Jowsey.

2904

RØYSET, S. **Eit 5-årigt forsøk med kopar og molybden til eng. [A 5-year experiment in applying copper and molybdenum to pasture.]** *Forskning og Forsøk Landbruket*, 1953, **4**, 401–422. [Statens Forsøksgård Fureneset, Norway.] English summary.

A manurial trial continued for 5 years on this west coast experiment station is described in detail. All the plots had N, P, K, Mg, Mn and B and the experimental plots received copper sulphate, ammonium molybdate or both. In 1950, after the first cut, and in 1952, all the plots were sprayed with cobalt chloride. Analyses are reported. The increases in yield with Mo indicated a deficiency of that element. Mo alone reduced, and Cu alone raised Cu, Mg, protein and fat in the crop. These elements singly and together reduced Co by about the same amount.—I. Leitch.

2905

DAVIES, E. B. and GRIGG, J. L. **Molybdenum and its use in grassland production.** *N.Z. J. Agric.*, 1953, **87**, 561–567. [Soil Res. Stat., Rukuhia.]

2906

HUDSON, W. J. and CRADOCK, F. **Major and minor elements. Deficiencies in pastures and crops in New South Wales.** *Agric. Gaz. N.S.W.*, 1953, **64**, 456–459; 474–475; 523–527; 597–599.

2907

KOLOUŠEK, J. and COULSON, C. B. **Plant proteins. 1. Extraction of hay proteins and nitrogen distribution.** *J. Sci. Food Agric.*, 1954, **5**, 126–132. [Agrobiochem. Lab., Fac. Agric., Technická 1903, Prague XIX, Czechoslovakia.]

Samples of red clover, orchard grass and timothy cut at the mature stage, and of alfalfa cut at 5 stages of growth, were examined. Protein preparations were obtained from air-dried samples by extracting with 0.2 per cent. NaOH and precipitating with glacial acetic acid. N was estimated in the material insoluble in NaOH and in the material soluble in NaOH but not precipitated by acetic acid. The protein preparation was freed from chlorophyll and lipids by extraction with ether. True protein and pepsin-insoluble N were estimated in the original samples. In the alfalfa samples the protein N obtained by alkali extraction was linearly related to the true protein N and the alkali-insoluble N was of the same order as the pepsin-insoluble N.—W. Godden.

2908

SMITH, A. M. **Seasonal variation in the quality of grass silage.** *J. Sci. Food Agric.*, 1954, **5**, 48–51. [Edinburgh and E. Scotland Coll. Agric., 13 George Sq., Edinburgh 8.]

Dry matter, crude protein and pH were estimated in 1244 samples of grass silage examined for advisory purposes over the 4 seasons 1949 to 1953.

The following results were obtained: 41 per cent. of the samples contained between 11 and 14 per cent. crude protein; 58 per cent. contained more than 20 per cent. dry matter; 63 per cent. were well preserved. In a dry year the proportion of samples poor in protein increased and in a wet year the reverse was true. The dry matter content varied in the opposite direction.

It was concluded that good conservation, resulting from satisfactory fermentation and reduction of pH to below 4.5, is most readily obtained when the crop contains more than 20 per cent. dry matter. Very wet material should be allowed to dry off a little before ensiling.

P. C. Jowsey.

2909

BARNETT, A. J. G. and DUNCAN, R. E. B. **Volatile fatty acids in laboratory and field silage.** *J. Sci. Food Agric.*, 1954, **5**, 120–126. [Div. Agric. Biochem., Dept. Biol. Chem., Univ. Aberdeen.]

Volatile fatty acids were estimated in samples of minced grass or kale which had been incubated at temperatures from 17° to 62° C., under aerobic or anaerobic conditions, for periods up to 20 weeks. Formic acid and acids higher than C₆ were not found. The principal acid present in all samples and at all periods was acetic; the next in amount was butyric acid. In samples of field silage, straight-chain acids from C₁ to C₈ were present; the only branched-chain acid present was isovaleric acid. The principal volatile acid was acetic acid.

W. Godden.

2910

DIJKSTRA, N. D. Verliezen bij het inkuilen van bietenkoppen en -blad. [Losses in ensiling beet tops and leaves.] *Landbouwwoorlichting*, 1953, **10**, 358–366. [Rijkslandbouwraproefstat., Hoorn.]

Silage was made in several ways: from chopped material in a drained and an undrained silo, from unchopped material in a drained silo, chopped in a wooden container on the ground, unchopped in a stack on the ground, completed in one day or over 5 days. The unchopped material heated, the chopped did not; the unchopped contained about 0.2 per cent. butyric acid, the chopped none. Sugar disappeared from all samples. In comparison with the original analysis, protein, fibre and ash, including Ca and Cu, rose; Mg and P were unaltered and K, Na, Cl and S were reduced. Loss of organic matter was from 25 to 32 per cent. and of crude protein from 15 to 25 per cent. except for the last, 5-day, stack silage, where it was 53 per cent. Unchopped beet lost more protein than chopped. Otherwise there was little difference attributable to the way of making the silage.—I. Leitch.

See also Abst. 2763.

MISCELLANEOUS

2911

NOVOKHATSKII, I. P. and KALININ, S. K. [Fluorine content of some natural Kazakhstan waters according to spectrum analysis.] *Dokl. Akad. Nauk. S.S.S.R.*, 1953, **93**, 289.

2912

WILSON, D. C. **Fluorine content of some Nigerian waters.** *Nature*, 1954, **173**, 305. [Lab. Human Nutrit., Univ. Oxford.]

The rocks of the Central Plateau are known to have a high F content, but of 10 samples of water analysed in this area none had more than 0.4 p.p.m. A mild degree of dental fluorosis was seen among tribesmen living on the Plateau. F occurs also among minerals in the Niger and Benue valleys, but of 65 schoolgirls between 7 and 15 years of age examined, only 8 showed mottling of the teeth. In another area where well waters had F contents from 0.1 to 1.2 p.p.m., 6 of 38 girls examined had a moderate amount of mottling.

It was concluded that the F in these pre-Cambrian rocks dissolves in drinking waters to a small extent only.—D. Harvey.

2913

WOJCIECHOWSKA, W. and KOŁACZKOWSKI, S. Fluor w wodach na terenie województwa poznańskiego. [Fluorine in water in the province of Pozan.] *Rocz. Państwowego Zakł. Hig.*, 1953, No. 3, 239–246. [Stac. Sanit.-Epidemiol., Poznan.] Russian and French summaries.

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The mean F content of the water supply and of well water in Poznan was 0.23 mg. per litre with a variation from 0 to 1.1 mg., the highest value being found in the district of Kalisz and attributed to the presence of calcareous Jurassic rocks. It is suggested that F should be added to the water supply in order to prevent dental caries. (From summary.)—J. S. Thomson.

2914

VENKATESWARLU, P. and NARAYAN RAO, D.
Studies in endemic fluorosis: Visakhapatnam

and suburban areas: distribution of fluorine in local waters. *Indian Med. Gaz.*, 1953, **88**, 262–265. [Dept. Biochem., Andhra Med. Coll., Visakhapatnam.]

F was estimated in over 170 samples of surface, spring and well waters from the Visakhapatnam district. The content ranged from a trace to 11 p.p.m. but was generally between 0.5 and 2 p.p.m. Some places showed wide local variations, ascribed to the presence of F-bearing apatite rocks. The occurrence of endemic fluorosis is considered likely.—W. M. Deans.

3. VITAMINS

GENERAL

2915

NOBILE, S. Le dosage des vitamines dans les produits alimentaires. [**Estimation of vitamins in food products.**] *Internat. Ztschr. Vitaminforsch.*, 1954, **25**, 243–252. [Hoffman La Roche Cie, S.A., Basle.]

A lecture review.

2916

POLISTER, B. H. and MEAD, J. F. **Irradiation effects. Effect of certain vitamins and anti-oxidants on irradiation-induced autoxidation of methyl linoleate.** *J. Agric. Food Chem.*, 1954, **2**, 199–202. [Sch. Med., Univ. California, Los Angeles.]

Emulsions of methyl linoleate with a uniform particle size of 5 μ . were exposed to X-rays at 25 r per min.

The presence of catalase or hydrogen peroxide did not affect the formation of hydroperoxides as a result of exposure to X-rays. Vitamin A alone was not affected by X-rays; when added to the linoleate it was completely destroyed at low concentrations but at high concentrations it inhibited the oxidation process. Tocopherol and Ionol, a commercial anti-oxidant, were effective against oxidation at concentrations so low that the extent of their own destruction was not measured. Calciferol was not affected by X-rays when added to the emulsions but was only partly effective in protecting the linoleate. Ascorbic acid, at a concentration of 9.4 mol. per cent. or more, completely protected the linoleate, and at 5.0 mol. per cent. was still partly effective.

Glutathione enhanced the oxidation of linoleate and was itself extensively oxidised even before exposure to X-rays. When cysteine was added the gradual appearance of an absorption peak was consistently observed and it is thought that formation of a compound with methyl linoleate took place, which was catalysed by peroxide.

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It is concluded that if fatty foods are sterilised by means of X-rays, anti-oxidants can be used to prevent destruction of vitamins.—V. R. Jackson.

2917

KOZUMPLÍK, J. and MLÁDEK, F. Poruchy z nesprávné výživy za březosti, za porodu a po porodu. [**Disturbances of pregnancy, parturition and the post-partum period caused by incorrect nutrition.**] *Veterinářství*, 1953, **3**, 262–264. [Vet.Fac. Agric., Univ. Brno.]

Disturbances occurring during pregnancy, parturition and the post-partum period, associated with deficiency of vitamins A, B, C, D or E, or minerals, and with unsuitable feeding, are described.—M. Prokšová (Czechoslovakia).

2918

VUKINA, R. Utjecaj vitaminskog dodatka "Dohyfral A + D₃" na razvitak težine i mortaliteta pilića te na nesivost kokoši. [**The influence of "Dohyfral A + D₃" vitamin preparation on weight gain and mortality in chickens and on the laying capacity of hens.**] *Veterinaria*, 1953, **2**, 332–339. English summary.

As source of vitamins A and D₃ in feeding experiments with chickens, Dohyfral was cheaper than cod liver oil. Mortality in a group of chickens given Dohyfral was 28 per cent. less than in an untreated group, and egg yield rose by 27 per cent. S. Pribićević (Yugoslavia).

2919

GORB, T. V., PLYUSHCH, M. G. and ROS, I. F. [**Influence of vitamins A, D and C on the growth and health of sucking pigs.**] *Sovet. Zootech.*, 1952, No. 12, 82.

2920

ROBINSON, K. L. **The use of synthetic vitamins and antibiotics in non-ruminant feeding.** *Proc.*

20

Nutrition Soc., 1954, **13**, 27-31. [Dept. Agric. Chem., Queen's Univ., Belfast.]

27 to 33 and from 760 to 940, and for vitamin D from 2.9 to 3.5 and from 80 to 100.—E. M. Hume.

2921

SHAPOSHNIKOV, N. G. [Influence of protein-vitamin paste on the survival and growth of young pigs and on the weight increments of young pigs being fattened.] *Sovet. Zootekh.*, 1953, **8**, No. 3, 72.

2922

SQUIBB, R. L., GUZMÁN, M. and SCRIMSHAW, N. S. Dehydrated desmodium, kikuyu grass, ramie, and banana leaf forages as supplements of protein, riboflavin, and carotenoids in chick rations. *Poultry Sci.*, 1953, **32**, 1078-1083. [Inst. Agropecuario Nac., Guatemala.]

For a series of growth trials with chicks forage meals were prepared from desmodium (16 in. high, stems and leaves), kikuyu grass (5 in. high), ramie (16 in. high, entire plant) and banana leaves with the heavy centre vein removed, dried at 115° F. in moving air. The meals contained, per cent., respectively, crude protein 12.9, 16.3, 22.4 and 16.1, crude fibre 20.7, 19.0, 11.9 and 18.6, and ash 7.4, 9.7, 17.7 and 12.1. Analysis showed that the experimental meals were equal or superior to average alfalfa meals in their content of carotenoids, vitamin B₁, riboflavin and nicotinic acid. The banana leaf meal had the high value of 45.6 p.p.m. riboflavin.

In the first trial 6 groups of chicks, receiving a low-lysine ration of sesame oilmeal 45, yellow maize meal 50, and vitamin and mineral supplements, finished at 5 weeks of age with a mean weight of 186 g. Comparable groups receiving the same ration supplemented with 20 per cent. of kikuyu grass, ramie or banana leaf meal, at the expense of sesame and maize, weighed 238, 249 and 237 g., respectively.

In two further trials, each meal included as 5 per cent. of the ration proved a satisfactory source of riboflavin and carotene. It is concluded that with care in selection of forage and in drying, tropical forage meals can be prepared equal in nutritive value to the alfalfa meals used for poultry feeding in temperature climates.—K. J. Carpenter.

2923

VALDMAN, A. R. [Increasing the vitamin content of milk.] *Sotzial. Zhiv.*, 1952, **14**, No. 12, 8.

2924

Recommended vitamin standards for margarine. *Med. Officer*, 1954, **91**, 145.

The Report of the Food Standards Committee of the Ministry of Food is summarised. The amounts recommended, for margarine, in I.U. per g. and per oz., respectively, are for vitamin A from

2925

WU, C. H. and FENTON, F. Effect of sprouting and cooking of soybeans on palatability, lysine, tryptophane, thiamine, and ascorbic acid. *Food Res.*, 1953, **18**, 640-645. [State Coll. Home Econ., Cornell Univ., Ithaca, N.Y.]

Soya beans of the Seneca variety were sterilised with hypochlorite and then allowed to germinate in the dark for from 6 to 7 days at from 17° to 27° C. Rootlets were removed, leaving an edible portion of from 62 to 87 per cent. The sprouted beans were cooked by boiling in unsalted or salted water or in a little salted water with lard. Estimations were made, in unsprouted, sprouted and cooked beans, of lysine and tryptophan microbiologically, vitamin B₁ by the thiochrome method, and ascorbic acid by the xylene method. Assessments were made of palatability.

Lysine content in unsprouted beans was 1767 mg. per 100 g., of which only 36 per cent. was found in the edible portion of the sprouted beans. The percentage retention after cooking by the 3 methods was 92, 93 and 89, respectively. Unsprouted beans contained 456 mg. tryptophan per 100 g., of which 61 per cent. was retained in the edible portion after sprouting. Retention after cooking ranged from 77 to 85 per cent.

Unsprouted beans contained 1.1 mg. vitamin B₁ per 100 g., of which 48 per cent. was retained in the edible portion after sprouting. Retention after cooking ranged from 63 to 72 per cent. Of ascorbic acid in mg. per 100 g., unsprouted beans contained 4.2, uncooked sprouts 10.6 and beans 20.6, but on a dry weight basis sprouts contained twice as much as beans, 182.8 and 76.0, respectively. Retention after cooking and holding for 1 hr. ranged from 27 to 38 per cent.

Percentage moisture contents were for unsprouted beans 12, sprouts 94, beans 73 and sprouted beans 83.

Differences in palatability after cooking by the 3 methods were not important.—V. R. Jackson.

2926

TEPLY, L. J., DERSE, P. H., KRIEGER, C. H. and ELVEHJEM, C. A. Nutritive value of canned foods. Vitamin B₆, folic acid, beta-carotene, ascorbic acid, thiamine, riboflavin, and niacin content and proximate composition. *J. Agric. Food Chem.*, 1953, **1**, 1204-1207. [Wisconsin Alumni Res. Found., Madison.]

The various nutrients were estimated in 48 canned products of animal and vegetable origin, as part of the nutrition programme of the National Canners Association and Can Manufacturers Institute. Of 48 products, 16 were analysed for the

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first time, and, of the remainder, additional samples were examined in order to complete the programme with respect to geographical distribution and volume of production.

Values for β -carotene, ascorbic acid, vitamin B₁, riboflavin and nicotinic acid and for proximate composition confirmed those previously reported (*Nutrition Rev.*, 1949, 7, 142; 144). On the basis

of total edible content, the values for vitamin B₆ were highest in pineapple juice, maize, tomatoes, cherries and meat products, and for folic acid in spinach, asparagus, beans, peas, blackberries, boned chicken and oysters.

The results include new information considered of use to dietitians.—V. R. Jackson.

See also Abst. 3518.

VITAMIN A

2927

BERGER, S. Metoda ilościowego oznaczania β -karotenu (prowitamin A) i sumy karotenoidów w niektórych produktach roślinnych. [A method for estimating β -carotene (provitamin A) and total carotenoids in some plant materials.] *Rocz. Państwowego Zakł. Hig.*, 1953, No. 4, 473–479. Russian and English summaries.

Four methods of estimating β -carotene and total carotenoids in fresh and dried plant material (Abst. 1954, Vol. 11; 1003, Vol. 13) were compared. Some modifications are suggested and the results of 81 estimations are tabulated. (From summary.)—W. Godden.

2928

BLAIN, J. A., HAWTHORN, J. and TODD, J. P. The bleaching of carotene by a lipoxidase-linoleate system. *J. Sci. Food Agric.*, 1953, 4, 580–587. [Food Sci. Sect., Royal Tech. Coll., Glasgow.]

A system for studying the coupled oxidation of carotene by lipoxidase is described. Buffer solution, aqueous sodium linoleate, a solution of carotene in acetone and ethanol, and lipoxidase from soya beans were mixed and shaken for 1 min. Sodium hydroxide was then added to stop the reaction and to clarify the solution, and the carotene remaining was estimated absorptiometrically.

The effect of pH was studied in detail and is discussed. The pH-activity curve was complex with a maximum at pH 5. The kinetics of the system are described and several curves are presented. Certain characteristics of the linoleate system in absence of carotene also were studied by measuring diene conjugation spectrophotometrically at 234 m μ . The light absorption curve of carotene in the system was different from that in chloroform solution; evidently its state of dispersion was different in aqueous solution and in organic solvents.

It is considered that the system may be used to measure the lipoxidase activity of soya beans, wheat products and possibly other materials, the method being, for instance, suitable for industrial control work.—V. H. Booth.

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2929

DEUEL, H. J. (Jr.), GANGULY, J., WALLCAVE, L. and ZECHMEISTER, L. Provitamin A activity of a structural isomer of cryptoxanthin and its methyl ether. *Arch. Biochem. Biophys.*, 1953, 47, 237–240. [Dept. Biochem., Univ. S. California, Los Angeles.]

The activity as provitamin A of isocryptoxanthine or 4-hydroxy- β -carotene and its methyl ether was compared with that of all-*trans*- β -carotene biologically with rats. The carotene was given in daily amounts of 0.5 and 1.0 μ g., and the two test substances in daily amounts of 1, 2 and 4 μ g. When the gain in weight was plotted against the logarithm of the dose, isocryptoxanthine and its methyl ether had about half the vitamin A potency of all-*trans*- β -carotene.—R. J. Ward.

2930

GANGULY, J., KRINSKY, N. I., PINCKARD, J. H. and DEUEL, H. J. (Jr.) Untersuchungen über den Carotinoid-Stoffwechsel. 14. Biologische Wirksamkeit von Echinenon. [Studies of carotenoid metabolism. 14. Biological activity of echinenone.] *Hoppe-Seyler's Ztschr.*, 1953, 295, 61–66. [Dept. Biochem. Nutrit., Univ. S. California, Los Angeles.]

Echinenone, isolated from the Californian sea urchins, *Strongylocentrotus purpurata* and *S. franciscanus*, had 54 per cent. of the activity of all-*trans*- β -carotene in growth tests with rats. When large doses of echinenone were given to deficient animals the absorption spectrum of the liver oil gave evidence that vitamin A was formed, which was confirmed by mixed fluorescence chromatography of liver extracts from rats given echinenone or β -carotene.—T. Moore.

2931

COLLINS, F. D., GREEN, J. N. and MORTON, R. A. Studies in rhodopsin. 7. Regeneration of rhodopsin by comminuted ox retina. *Biochem. J.*, 1954, 56, 493–498. [Dept. Biochem. Univ. Liverpool.]

Satisfactory regeneration of rhodopsin has already been achieved with frog and rat retinas (Abst. 2832, Vol. 23) but their small size was a

drawback. The method of preparing comminuted ox retina is described in detail, but regeneration of rhodopsin from synthetic vitamin A by the retina preparation was not at first attained. It was, however, established that the preparation was capable of synthetic phosphorylation processes. Tween 80 was adopted for dispersal of vitamin A in preference to Dispersol A. In contrast with rat eye tissue, better regeneration was obtained with retina only than with retina and choroid. For the incubation medium, vitamin A and phosphate buffer only were necessary; adenosinetriphosphate need not be included. Delay of as little as 30 min. adversely affected the power of regeneration; the effect of delay was counteracted by addition of diphosphopyridine nucleotide. Presence of pyridoxal phosphate increased the amount regenerated. Exposure to light of retinene or synthetic vitamin A before incubation gave a greater amount of regeneration. The power of regeneration was in the insoluble part of the retina preparation, showing that no water-soluble enzymes took part. The mechanism of regeneration is discussed.—E. M. Hume.

2932

BIERI, J. G. and POLLARD, C. J. **Studies of the site of conversion of β -carotene injected intravenously into rats.** *Brit. J. Nutrition*, 1954, **8**, 32-44. [Dept. Biochem. Nutrit., Univ. Texas Med. Branch, Galveston.]

Weanling rats depleted of vitamin A, but without signs of deficiency, were given a single oral or intravenous dose of 4.0 μ g. β -carotene in 1 per cent. Tween 40 or 18.8 μ g. carotene and 0.3 mg. α -tocopherol in 20 per cent. Tween 40. With the 4 μ g. dose the rats treated by injection grew better than those treated by mouth; with the dose of 18.8 μ g. carotene and 0.3 μ g. tocopherol those treated by mouth grew better than those treated by injection.

Rats which had shown signs of deficiency for 2 or 3 days were given a single dose of 5.2 μ g. carotene with or without tocopherol; the response to injection was very poor. With the oral dose the group given tocopherol put on more weight than those without it.

The average total carotene content of various tissues 4 hr. after a single injection of 69 μ g. carotene in aqueous dispersion is listed. On the average, 67.2 per cent. of the injected carotene was recovered. No carotene was found in the urine or faeces of rats 4 days after an intravenous injection of 96 μ g. solubilised carotene.

An intravenous injection of 100 μ g. carotene was given in aqueous dispersion; the carotene content of the serum after 5 min. was 2130 μ g. per 100 ml.; after 12 hr. it was 277, and after 48 hr. there was none. The concentration of vitamin A in the

serum reached a maximum of 134 μ g. per 100 ml., after 6 hr. The maximum concentrations of both carotene and vitamin A in the liver occurred after 12 hr., and in the kidneys after 18 hr.

Deficient rats were given either 76 μ g. carotene by intravenous injection or 152 μ g. by mouth. The vitamin A value for the serum of those treated orally and by injection was, respectively, 71 and 36 after 1 day, and 13.5 and 6.1 after 15 days.

When from 98 to 110 μ g. carotene were given in divided doses on 4 successive days either by mouth or by vein, the concentrations of vitamin A in the liver and kidneys were almost identical, but the serum of the injected animals had a slightly higher concentration of vitamin A and the liver a much higher concentration of carotene.

Rats subjected to anaesthesia, abdominal incision and handling of the viscera had an amount of vitamin A in the serum and liver 4 to 6 hr. after an intravenous injection similar to that in intact animals. Ligation of the bile duct or removal of the kidneys or of 60 to 70 per cent. of the liver did not impair the formation of vitamin A from carotene. When the entire small intestine was removed, the formation of vitamin A from injected carotene was similar to that in animals not so treated.—R. J. Ward.

2933

HJARDE, W., NIELSEN, J. and POROTNIKOFF, O. **Utilization of carotene by dairy cows.** *Acta Agric. scand.*, 1954, **4**, 3-16. [Statens Vitaminlab., Copenhagen.]

Twenty-four Shorthorn or Black-spotted Danish Dairy cows aged from 2 to 12 years were divided into groups A, B, C and D, of 6 animals each. In a preliminary feeding period of 35 days all the cows received mixed fodder which supplied about 350 mg. carotene daily. There followed a transition period lasting 7 days and then 2 experimental periods of 30 and 40 days. During the transition and first experimental periods, group A received an intermediate amount of about 200 mg. carotene daily, given in the silage. Group B received a large amount of about 550 mg.; group C had 210 mg. carotene in solution in oil, and group D had a small amount of about 45 mg. from fodder, not silage. In the second experimental period the groups received approximately 350, 950, 890 and 45 mg. carotene, respectively, group C again being given its carotene in oil. Estimations at the end of the preliminary period and during the experimental periods of the amounts of carotene excreted in the faeces compared with the amounts supplied in the feed showed that the carotene was poorly utilised, and no better in group D which received barely enough to cover the normal vitamin A requirement. Analysis of the milk showed that after 20 days in the second experimental period the

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vitamin A content in I.U. per g. butterfat was 23.3 in group A, 24.8 in group B and 24.7 in group C. The carotene content of the butterfat was higher in the last two groups. Values for both carotene and vitamin A were low in the milk from the cows in group D. Analysis of the liver of 8 animals killed at the end of the experiment showed no relation between the quantity of carotene given and the total amount of carotene and vitamin A found, but there was a consistent increase in the vitamin A content with increasing age.

I. M. Sharman.

2934

CHANDA, R., CLAPHAM, H. M. and OWEN, E. C.

Dietary carotene and the degree of esterification of vitamin A in the milk and blood of cows.

Biochem. J., 1954, **56**, 453-458. [Hannah Dairy Res. Inst., Kirkhill, Ayr.]

Four lactating Ayrshire cows were maintained for 20.5 weeks on an experiment divided into 7 periods of about 3 weeks each. In periods 1, 3 and 6 the diet was free from carotene. In periods 2, 4 and 5 the diet included carotene as a natural constituent of dried grass and lucerne meals, and in period 7 the cows received fresh grass in a grazing trial. The carotene content of the feed in mg. per 100 g. was 2.96 in period 2, 5.26 in period 4, 6.28 in period 5 and 22.61 in period 7.

In confirmation of the authors' previous results, carotene deprivation caused the content of vitamin A alcohol in the milk to increase, the average values being 7, 6 and 6 I.U. per 100 ml. for the respective periods when carotene was present in the diet, and 13, 13.5 and 14 for the periods without carotene. The concentration of vitamin A alcohol in the blood was not affected by withdrawing carotene from the ration. In period 2 values for vitamin A ester in the blood ranged from 9.7 to 12.5 I.U. per 100 ml. but in period 3 fell to zero; the values rose to between 21.2 and 29.6 in periods 4 and 5 when carotene was present in the diet but fell again to zero in period 6 when the diet contained no carotene. From the present experiments and from earlier ones in which cows treated with thyroxine showed an increase in the content of vitamin A alcohol in the milk, it is concluded that increase of vitamin A alcohol is due to transfer of vitamin A to the milk from the liver.—I. M. Sharman.

2935

PATERSON, J. C. S. and WIGGINS, H. S. **An estimation of plasma vitamin A and the vitamin A absorption test.** *J. Clin. Pathol.*, 1954, **7**, 56-60. [Postgrad. Med. Sch., London.]

Vitamin A was estimated in specimens of heparinised plasma by extraction with *n*-heptane after addition of ethanol. The heptane extract was divided into 2 portions of which one was treated

for 3 hr. with ultraviolet light. The optical density of the non-irradiated portion was estimated at 327 m μ , the irradiated specimen giving the blank setting in a quartz spectrophotometer. A calibration curve was obtained by plotting the difference between the optical densities of irradiated and non-irradiated solutions of a sample of international standard vitamin A in heptane. Under the conditions used the destruction of vitamin A was shown to be complete within 3 hr.

Specimens of plasma from 2 patients with idiopathic steatorrhoea were examined before and 4, 8 and 12 hr. after the patients had been given, by mouth, 350,000 I.U. vitamin A ester in oil. The absorption curves were repeated with a similar dose of vitamin A emulsified with sorbitan monooleate. Values after 4 hr. were 43 and 102 I.U. vitamin A per 100 ml. when the vitamin was given in oil and 65 and 125 when given with the emulsifying agent. Eight patients with steatorrhoea and 11 normal subjects were given vitamin A at the rate of 7500 I.U. per kg. bodyweight, as crystalline vitamin A alcohol or palmitate dissolved in arachis oil. Flat absorption curves were obtained from patients with steatorrhoea; those of the normal subjects "peaked" after 4 hr., with plasma values between 600 and 1500 I.U. per 100 ml. It is suggested that though flat curves are not necessarily diagnostic of steatorrhoea, the finding of a plasma vitamin A value of 500 I.U. or more, 4 to 5 hr. after a dose of the vitamin of the order indicated, should almost certainly exclude a diagnosis of steatorrhoea.—I. M. Sharman.

2936

BOBBY, F. C., THOMPSON, J. J. and BELWORTHY, W. R. **Feeding synthetic vitamin A to laying pullets.** *N.Z. J. Agric.*, 1953, **87**, 313-316. [Poultry Indust., Dept. Agric., Wellington.]

Pullets in 3 groups were given a basal diet with supplements of 2000 I.U. vitamin A and 200 I.U. vitamin D per 100 lb. mash. Groups 1 and 2, which were duplicates, were given vitamin D₃ and vitamin A as the synthetic palmitate and group 3 was given a fish liver oil. Records were made of egg production, food consumption, mortality and vitamin A content of the liver. In 44 weeks the average number of eggs was 150.6, 130.5 and 150.5, and the average feed consumption in lb. per head was 85.6, 85.7 and 91.0, respectively. There were 7 deaths in group 1, 5 in group 2, and 6 in group 3. The average vitamin A content of the liver in I.U. per g. was 912, 848 and 1072.—R. J. Ward.

2937

SKATIN, Y. D. **A-avitaminoz tzyplyat. [Vitamin A deficiency in chicks.]** *Veterinariya*, 1952, **29**, No. 8, 41-43. [Saratov. Mezhsovkh. Vet.-Bacteriol. Lab.]

The clinical and pathological features are described of an outbreak of disease in fowls, diagnosed as vitamin A deficiency. The condition responded well to administration of vitamin A concentrate and fish oil. Of eggs from the birds during the period of deficiency only 54.5 per cent. hatched, and the chicks showed signs of severe vitamin A deficiency from the first day. The response to treatment was unsatisfactory. It is suggested that, during incubation, changes occur in the gastro-intestinal tract which reduce the effectiveness of administered vitamins.—D. W. Taylor.

2938

HOEKSTRA, W. G., HALL, R. E. and PHILLIPS, P. H. **A study on the relationship of vitamin A to the development of hyperkeratosis (X disease) in calves.**

HOEKSTRA, W. G., DICKE, R. J. and PHILLIPS, P. H. **Production of hyperkeratosis in calves, with a topically applied oil-based insecticide carrier.** *Amer. J. Vet. Res.*, 1954, **15**, 41-46; 47-50. [Dept. Biochem., Univ. Wisconsin, Madison.]

Field studies showed that about 70 per cent. of calves suffering from some degree of hyperkeratosis (see next paragraph) had less than 10 μ g. vitamin A per 100 ml. blood plasma. A supplement of from 600,000 to 750,000 I.U. vitamin A for from 9 to 12 days usually resulted in a normal vitamin A value in the blood, less diarrhoea and coughing and improved appetite. In a controlled experiment 9 bull calves were divided into 3 groups, of which one received non-toxic pellets, and 2 received pellets known to have produced hyperkeratosis, of which one received in addition 25,000 I.U. vitamin A daily. During 5 weeks of milk feeding the vitamin A value in the plasma of the calves of the first group remained at about 14 μ g. per 100 ml. and that of the third group rose to about 20 μ g. per 100 ml. No sign of hyperkeratosis appeared. With the discontinuance of milk feeding, pellet consumption increased to 1 lb. per calf daily. The vitamin A value in the plasma of the group having toxic pellets without vitamin A showed a rapid decrease to about 2 μ g. per 100 ml.; the calves then lost weight and died with typical lesions of hyperkeratosis; in the calves having non-toxic pellets the value fell to and remained at 11 μ g. per 100 ml. In the calves receiving toxic pellets and vitamin A it fell to about 8 μ g. per 100 ml. and rose again to about 16 μ g. per 100 ml. when the toxic pellets were replaced by non-toxic pellets.

For a description of the disorder, see Abst. 1523, Vol. 18. Calves divided into 6 groups of 2 were given a practical ration. After an initial period of 3 weeks the groups were treated as follows: group 1, control, no treatment; 2, sprayed with

0.05 per cent. lindane in mineral seal oil (a petroleum fraction); 3, sprayed with 10.5 per cent. methoxychlor in mineral seal oil; 4, sprayed with 3.2 per cent. lethane and 2.3 per cent. thanine (thiocyanate compounds) in mineral seal oil; 5, X-disease controls receiving by mouth 0.1 g. highly chlorinated naphthalene in maize oil daily for 6 days; 6, sprayed with mineral seal oil only. The X-disease control calves of group 5 developed some of the usual signs of the disease but did not show skin lesions. Those of groups 2, 3, 4 and 6 developed hyperkeratosis, and a consistent, clear-cut drop in the level of vitamin A in the plasma occurred within a week. The fall of vitamin A in the plasma was not so sharp when chlorinated naphthalene was given by mouth. The vitamin A content of the livers showed that reserves had not been depleted at the time of slaughter.—R. J. Ward.

2939

KRUKOVSKY, V. N., TRIMBERGER, G. W., TURK, K. L., LOOSLI, J. K. and HENDERSON, C. R. **Influence of roughages on certain biochemical properties of milk.** *J. Dairy Sci.*, 1954, **37**, 1-9. [New York State Coll. Agric., Cornell Univ., Ithaca.]

All cows were given 10 lb. grain concentrate daily and as much as they could eat of conserved mixed herbage of 4 kinds: early silage, cut 1 June; barn-cured hay, cut 18 June; late silage, cut 10 July, and field-cured hay, cut 10 July. They were given in a design [not specified] each for 5 weeks at a time, to one of 4 groups of 3 cows. At the end of each 5-week period tocopherol, vitamin A and carotene were estimated in the milk. Copper was added to samples of the milk and changes in palatability were recorded during 10 days.

Early silage had the highest tocopherol and carotene content and hay the lowest. The fat of milk produced with early silage had most, and with hay least, tocopherol, vitamin A and carotene.

Oxidised flavour in presence of copper developed most slowly in milk produced with late silage, although it had only two-thirds the tocopherol content of milk produced with early silage. Evidently some protective substances other than tocopherols were present in the more mature roughages. The milk of some cows continued to contain such substances long after the test was discontinued; their origin and mode of action is discussed. Seasonal changes in the herbage might have been concerned.—V. R. Booth.

2940

DAVIES, A. W. and WORDEN, A. N. **The stability of vitamin A in animal feeding-stuffs.** *J. Sci. Food Agric.*, 1954, **5**, 107-112. [Cromwell House, Huntingdon.]

Cod liver oil was mixed into typical feedingstuffs ground to 2 different degrees of fineness, with and without the addition of mineral salts. Portions of each of the 4 mixtures were stored in 9 different ways and vitamin A was estimated with the SbCl_3 reagent every few days for up to 15 weeks. Certain mixtures were cubed and stored.

Loss of vitamin A was greater in a mixture of coarse than of fine particles, but was reduced by cubing. It was much greater in the light than in the dark and was retarded at low temperatures. The loss was greater in open than in closed containers.

Cod liver oil was mixed with separate portions of individual ingredients of the feed to find out which had the greatest effect on the loss. The damaging effect of mineral salts on vitamin A was confirmed and was prevented by treating the mineral mixture with gelatine before adding it to the other ingredients. Yeast hastened the loss slightly. The loss was least in cod liver oil mixed with fishmeal and liver meal. In a few instances observations were made on the loss of carotene, which was usually destroyed more slowly than vitamin A.

The findings are discussed in relation to an extensive review of the literature. The different rates of loss of vitamin A from the synthetic palmitate and from cod liver oil are discussed also.—V. H. Booth.

2941

SIEDLER, A. J. and SCHWEIGERT, B. S. **Vitamin stabilization. Effect of added stabilized animal fats on stability of vitamin A in feeds.** *J. Agric. Food Chem.*, 1954, **2**, 193–195. [Div. Biochem. Nutrit., American Meat Inst. Found., Chicago 37, Ill.]

A typical dry meal for dogs was prepared in which fish liver oil was incorporated directly or dissolved first in pork fat stabilised by addition of butylated hydroxyanisole. Vitamin A was estimated chemically at intervals during storage for a year at room temperature. In a few weeks the curves showing loss of vitamin A diverged, and, after a year, more than half the vitamin was lost from the meal in which the fish liver oil was incorporated directly, and less than half from the meal containing the stabilised fat.—V. H. Booth.

2942

DAMMERS, J. **Stability of carotene in mixed feeds.** *Netherlands J. Agric. Sci.*, 1953, **1**, 245–250. [State Agric. Exp. Stat., Hoorn.]

Dried grass meal and a mixed feed, containing cereals, oilseed residues, mineral salts and 10 per cent. of the dried grass meal, were stored in paper bags. Carotene was estimated weekly. The average weekly percentage loss was 3.01 ± 0.19

from the mixed feed and 4.48 ± 0.29 from the grass meal. In another experiment the mixture contained meatmeal and fishmeal but no by-product of the oil industry. The average weekly percentage loss was 0.87 ± 0.14 from the mixture and 0.81 ± 0.24 from the meal. The first experiment was made in summer, the second in winter, which may explain the great difference in rate of loss. It is concluded that destruction of carotene in dried grass meal during storage is not increased by the presence of other feedingstuffs.

V. H. Booth.

2943

NARAYANAN, K. M., ANANTAKRISHNAN, C. P. and SEN, K. C. **Vitamin A in dairy products. 1. Stability of vitamin A and carotene in ghee fortified with synthetic vitamin A.** *Indian J. Dairy Sci.*, 1953, **6**, 189–195. [Indian Dairy Res. Inst., Bangalore.]

Samples of milk were obtained from 4 cows and 4 buffaloes maintained on two different diets, one including a liberal and the other a small supplement of green grass. Samples of cream were fortified with synthetic vitamin A acetate at 2 concentrations, 45 and 85 I.U. per g., and stored in different containers at 37°C . for 6 months.

After 3 months the loss of vitamin A was less than 3 per cent. in samples stored in glass, aluminium and tin containers but samples stored in mud pots lost 26.8, 59.4 and 94.4 per cent. at the end of 1, 2 and 3 months, respectively. Percentage loss of vitamin A after 6 months amounted to 14.1 for tin containers, 14.5 for aluminium, 14.8 for glass and 100 for mud pots. Fortified cow ghee was more stable, as regards both loss of vitamin A and peroxide development, than fortified buffalo ghee. Stability of vitamin A was not affected by the grass intake or by the level of fortification. The carotene content of cow ghee in glass, aluminium and tin containers remained unchanged for 2 months and then showed losses amounting to 5.6, 12.1, 12.2, and 13.9 per cent. after 3, 4, 5 and 6 months' storage. Cow ghee stored in mud pots showed losses of carotene amounting to 23.9, 53.8 and 95.8 per cent. at the end of 1, 2 and 3 months. Peroxide values were relatively higher at all stages for buffalo than for cow ghee.—I. M. Sharman.

2944

BRESSANI, R., CAMPOS, A. A., SQUIBB, R. L. and SCRIMSHAW, N. S. **Nutritive value of Central American corns. 4. The carotene content of thirty-two selections of Guatemalan corn.** *Food Res.*, 1953, **18**, 618–624. [Inst. Nutrición Central America, Guatemala.]

The β -carotene content of maize grown in Guatemala was estimated by a chemical method. From one site the average for 13 yellow varieties was 1.15 p.p.m. and for 11 white varieties 0.33. In

another area 4 yellow to red varieties averaged 1.57, and 4 white to black 0.14. Tiquisate Golden Yellow averaged 3.3 when grown on lowland sites and 1.8 when grown at 5000 ft.

Cryptoxanthol and other carotenoids were estimated in three varieties, in one (Tiquisate Golden Yellow) by a biological test with chicks, which gave a value for potency of 5.6 p.p.m. Since the β -carotene content accounted for less than half the biological activity, it is concluded that estimation of β -carotene alone is not a satisfactory measure of pro-vitamin A content. Most of the activity not accounted for by β -carotene was due to cryptoxanthol.—V. H. Booth.

2945

BUDOWSKI, P. El aceite de palma (*Elaeis guineensis*) como fuente de vitamina "A" en la alimentacion popular. [Oil of the palm *Elaeis guineensis* as source of vitamin A in the

national diet.] *Arch. venezol. Nutricion*, 1952, **3**, 309–328. [Inst. Nac. Nutrición.] English and German summaries.

In 22 samples of red palm oil grown in the state of Yaracuy there was an average value of 810 μ g. carotene per g. estimated chromatographically. Up to 90 per cent. of the carotene was β -carotene. The crude oil contained about 5 per cent. of free fatty acids calculated as palmitic acid. Loss of carotene during refining was not more than 30 per cent. unless the oil was exposed to temperatures above 160° C. for an hour or longer after neutralisation. Treatment with adsorbent bleaching agents removed much of the carotene, but partial bleaching gave a stable light yellow oil which, when mixed with hydrogenated cottonseed oil, provided a useful cooking fat, acceptable in flavour and consistency and providing a valuable source of carotene for Venezuelan diets.—A. M. Copping.

See also Abst. 2974.

VITAMIN D

2946

REKLING, E., GJEDDEBÆK, N. F. and STØRLING, E. Penicillinets evne til at forøge virkningen af D-vitamin ved experimental rotterachitis. [Capacity of penicillin to increase the activity of vitamin D in experimental rickets in rats.] *Nord. Med.*, 1954, **51**, 300–301. [A/S Ferrosans Forsøgslab., Copenhagen.] English summary.

Colonies of rats for use in the biological estimation of vitamin D must be uniformly fed on a diet which does not allow storage of vitamin D in the suckling young. When penicillin came to be used for the treatment of gastro-intestinal infections in the colony, results which had been satisfactorily consistent became unreliable, and analysis showed that the young from mothers given penicillin reacted as if they had had more than the amount of vitamin D given. Controlled experiments with graded amounts of vitamin D₃, alone or with 8000 I.U. penicillin given daily by mouth, showed that, as judged by planimetry of the epiphyseal line of the tibia, penicillin approximately doubled the potency of the vitamin. No explanation is offered.

I. Leitch.

2947

NICOLAYSEN, R. and EEG-LARSEN, N. The biochemistry and physiology of vitamin D. *Vitamins and Hormones*, 1953, **11**, 29–60. [Inst. Nutrit. Res., Univ. Oslo, Norway.]

2948

RAOUL, Y., LE BOULCH, N., CHOPIN, J., BARON, C., GUY, J., MEUNIER, P. and GUERILLOT-

VINET, A. Relations entre les formes nouvelle et ancienne de la vitamine D₃. [Relations between the new and old forms of vitamin D₃.] *C.R. Acad. Sci.*, 1954, **238**, 846–847.

The exact procedure is described for converting into one another classic vitamin D₃ and the new form of vitamin D₃ prepared from cholesterol without ultraviolet irradiation (Absts. 2853, Vol. 23; 346, Vol. 24). Some physical constants of the new substance were measured. It is suggested that classic vitamin D₃, isolated from fish liver oils, may be a product of transformation resulting from energetic treatment with alkali, and that the new substance may be the form of vitamin D₃ naturally active in the organism.—E. M. Hume.

2949

CAUSERET, J. Un nouvel aspect de l'action de la vitamine D sur la croissance. [A new aspect of the action of vitamin D on growth.] *C.R. Acad. Sci.*, 1954, **238**, 160–162.

Further evidence is put forward in support of the author's conclusion that vitamin D does not affect growth only by promoting the retention of Ca (Abst. 349, Vol. 24). Groups of 6 young rats weighing from 60 to 80 g. received a diet containing, per cent., casein 18, arachis oil 9, starch 45, sucrose 24, salt mixture of Hubbel without CaCO₃ 2, agar 2 and vitamins. By adding CaCO₃, diets were constituted containing Ca, per cent., 0.035, 0.055, 0.105, 0.155, 0.255, and 0.455; each diet was given to 2 groups, one receiving 300 I.U. vitamin D₃ per 100 g. diet and one not. For each of 4 successive periods of a week, bodyweight was recorded and Ca retention was measured. The

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results showed that on diets poor in Ca, with the same retention of Ca, growth might be much better if vitamin D was present in the diet. The effect was apparent from the beginning of the experiment. It seemed possible that the effect of vitamin D on appetite was important.

E. M. Hume.

2950

CLAASSEN, V. and WÖSTMANN, B. S. J. **The uptake of injected radioactive phosphorus in the skeleton of the growing white rat. 2. The effect of calciferol on the rapid uptake of ^{32}P by rachitic and control animals. 3. The metabolism of skeletal ^{32}P in experiments of longer duration, performed with rachitic and control animals.** *Biochim. biophys. Acta*, 1953, **12**, 577-583; 1954, **13**, 48-53. [Lab. Physiol. Chem., Netherland Inst. Nutrit., Municipal Univ., Amsterdam.] French and German summaries.

2. Rats were maintained from weaning on a modification of Steenbock and Black's diet containing, per cent., Ca 1.2 and P 0.3. Some received also 6 I.U. vitamin D_2 daily. After rickets had developed, half the rachitic and half the protected rats received by mouth 3000 I.U. vitamin D_2 , 5 or 72 hr. before intravenous injection of from 15 to 20 μC . ^{32}P as Na_2HPO_4 . The rats were killed 5 or 60 min. after the injection of ^{32}P , and the femur and plasma were analysed (for details of procedure, see Abstr. 1735, Vol. 24).

Five min. after injection, the content of ^{32}P in the femur of rachitic rats given vitamin D 72 hr. previously was slightly greater than of those not given vitamin D, but the difference was not significant; there was no difference between protected rats previously given and not given vitamin D. Sixty min. after injection of ^{32}P , the content of ^{32}P in the femur of rachitic rats given vitamin D 72 hr. previously was much greater than in those not given vitamin D. There was again no difference between protected rats. Administration of vitamin D 5 hr. before injection of ^{32}P had no detectable effect. It had also no effect on the value for inorganic P in the plasma of rachitic rats, which, however, was much increased by vitamin D given 72 hr. previously. In protected rats the values were unchanged.

It is concluded that the uptake of ^{32}P into the bone by exchange is not greatly influenced by administration of vitamin D, but that the uptake caused by increased calcification is much heightened.

3. Rats were maintained as above on Steenbock and Black's rachitogenic diet with or without 6 I.U. vitamin D daily. They were injected subcutaneously with ^{32}P as Na_2HPO_4 , and the increase in the amount of ^{32}P in the tibia during 14 days was

compared with the increase to be expected from skeletal accretion alone. For this purpose one hind leg was removed at the knee from young rats weighing about 120 g., 3 days after the injection of ^{32}P . Fourteen days later the rats were killed and the tibia from the other hind leg was taken. P and ^{32}P were estimated in each tibia and every 4 or 5 days in the plasma. The difference in phosphate content between the two tibiae combined with the specific activity (activity per mg. P) of the plasma inorganic phosphate was used to calculate the increase of the ^{32}P content of the bone caused by skeletal accretion during the experimental period. This value was compared with the difference in ^{32}P content actually found. Although the amount of P and ^{32}P taken up by the rachitic bone was less than by the non-rachitic bone, the behaviour of the two did not differ greatly. The increase in content of ^{32}P in the bone during the experiment was much less than would be expected from the action of skeletal accretion alone, and it is concluded that considerable loss of ^{32}P occurred by exchange with the plasma of radio-active for inactive material throughout the experimental period. The gain of ^{32}P by skeletal accretion was thus counteracted by loss through exchange with the plasma.—E. M. Hume.

2951

JOVANOVIĆ, M., TOMIĆ, V., KENTERA, D. and VUČO, J. Influence de la vitamine D sur le métabolisme du phosphore introduit par voie parentérale. [Effect of vitamin D on the metabolism of phosphorus given parenterally.] *Acta vet., Belgrade*, 1953, **3**, 117-126. [Inst. Physiol., Fac. Vet., Univ. Belgrade.] In Serbian: French summary.

Twenty-five rats in 3 groups were injected twice, with a 24-hr. interval, with 0.2 ml. Vigantol (vitamin D_2). The next day the 3 groups and 25 untreated rats received from 1 to 2 mC. radio-active phosphorus as Na_2HPO_4 . The concentration of P in the blood was estimated from the radio-activity of the blood, after 6 hr. in the first group, after 24 hr. in the second group and after 10 days in the third group.

In the first group the percentage of the radio-active P recovered in 1 ml. blood was 0.154 against 0.120 in the group not treated with vitamin D. In the second group the figures were 0.121 against 0.129 and in the third group 0.040 against 0.037.

It is concluded from the values for the first group that vitamin D stimulates, not only intestinal, but also parenteral absorption of P, and from the values for the second and third groups that large amounts of vitamin D do not cause retention of larger amounts of P in the blood or affect the intensity of P exchange between the blood and tissues.—S. Pribićević (Yugoslavia).

2952

STEENBOCK, H. and BELLIN, S. A. **Vitamin D and tissue citrate.** *J. Biol. Chem.*, 1953, **205**, 985-991. [Dept. Biochem., Coll. Agric., Univ. Wisconsin, Madison.]

Citrate was estimated in the blood, bone and tissues of female rats 5 weeks old, kept for from 8 to 36 days on cereal-free, semi-synthetic diets, low in P, or normal in P and half normal in Ca, or low in Ca, or low in Ca, P and Mg, or with no inorganic addition except 0.4 per cent. NaCl. The diets were given with and without addition of from 75 to 150 I.U. vitamin D every 3 days. In some tests NaHCO_3 was given to promote alkalosis.

With the rachitogenic diet low in P and with the non-rachitogenic diet normal in P and half normal in Ca, the citrate content of the blood, heart, kidneys, small intestine and bone was higher when vitamin D was given, but in the liver there was no difference. The citrate values were highest with a low intake of P, but the increases caused by vitamin D were greatest with an adequate supply of P. Alkalosis induced with NaHCO_3 had no effect on the blood value for citrate or on the action of vitamin D in raising it. The changes in the blood value for citrate induced by vitamin D could not be correlated with changes in the blood values for Ca and P. No evidence was found that the amount of citrate in bone was reduced in rickets; the amount seemed rather to be related to the animal's state of Ca nutrition. Administration of bicarbonate did not increase bone citrate. The increased urinary excretion of citrate previously observed after giving vitamin D (Abst. 338, Vol. 22) is considered to result from the increased accumulation of citrate in the tissues.

E. M. Hume.

2953

STEENBOCK, H., KRIEGER, C. H., WIEST, W. G. and PILEGGI, V. J. **Vitamin D and intestinal phytase.** *J. Biol. Chem.*, 1953, **205**, 993-999. [Dept. Biochem., Coll. Agric., Univ. Wisconsin, Madison.]

Groups of 5 Leghorn chicks, 2 days old, were fed, with or without vitamin D, on a practical poultry ration containing cereals or on a highly rachitogenic diet of, per cent., yellow maize 58, wheat middlings 25, casein 12, NaCl 1, $\text{Ca}_3(\text{PO}_4)_2$ 2, dried yeast 2, and $\text{MnSO}_4 \cdot 4\text{H}_2\text{O}$ 0.02. After from 4 to 8 weeks the chicks were killed; the tibiae were removed for ash analysis and the small intestine for phytase estimation. The intestine was washed, macerated and left to autolyse for 48 hr.; it was centrifuged and the centrifugate, suitably buffered, was incubated for 48 hr. at 37° C. with Na phytate as substrate. Inorganic P was estimated before and after incubation. With both diets vitamin D increased the percentage

bone ash from about 30 to about 40, and the units of phytase by from 50 to 100 per cent.

Similar tests were made on the 10 in. of the small intestine nearest to the stomach of rats given different diets with and without cereals, some of them rachitogenic, and with or without small or large doses of vitamin D. With vitamin D, the amount of intestinal phytase was always greater than without, whether the rats were rachitic or not, and whether the diet contained cereals or not. There was apparently no relation between the severity of the rickets and the degree of activity of intestinal phytase.—E. M. Hume.

2954

HANSSLER, H. Experimentelle Untersuchungen über das Verhalten der Nebenschilddrüse bei diätetisch erzeugter Rachitis und Tetanie. [Experimental studies on the behaviour of the parathyroid glands in rickets and tetany of dietary origin.] *Ztschr. ges. exp. Med.*, 1954, **123**, 91-100. [Kinderklin., Univ. Tübingen.]

Thirty rats weighing about 50 g. were kept in the dark on a complete diet of milk and bread, or on McCollum's rachitogenic diet No. 3143 low in P with or without vitamin D, or on a diet low in Ca with or without vitamin D. The rats were killed at intervals of up to 28 days. Ca and inorganic P were estimated in the blood, and the activity of the parathyroid glands was assessed by measuring the size of the cell nuclei in histological preparations. In a comparison of the rats having the complete diet, McCollum diet, and McCollum diet with vitamin D₃, the serum Ca values increased progressively in that order, and the size of the parathyroid nuclei correspondingly decreased.

In another experiment 38 rats were used. When the McCollum diet without vitamin D₃ was compared with the diet low in Ca with and without vitamin D₃, the blood values for the rats on the diet low in Ca without vitamin D₃ fell to just below 6 mg. Ca per 100 ml., and there was an increase in the size of the parathyroid nuclei; both effects were considerably modified towards normal when vitamin D₃ was added to the diet low in Ca. The values for the rats having the McCollum diet were as in the first experiment.

It is concluded that the activity of the parathyroid glands, as assessed by the size of the nuclei, was negatively related to the value for serum Ca.

E. M. Hume.

2955

MORETTI, I. La muscolatura striata nel rachitismo sperimentale. [Striated muscle in experimental rickets.] *Acta vitaminol.*, 1953, **7**, 240-245. [Ist. Anat., Univ. Pavia.] French, English, German and Spanish summaries.

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Twenty rats weighing from 24 to 30 g. were maintained on the rachitogenic diet 2964 of Steenbock and Black. Half of them died in the first 3 weeks, before the appearance of rickets. Of the remainder, some died and some were killed at intervals of up to 45 days with marked skeletal changes. The resistance of the muscles to traction was almost the same in the rachitic and normal rats. Examined histologically, the fibres of the skeletal muscles were attenuated and the nuclei appeared to be nearer together. In the myocardium there was no difference.—E. M. Hume.

2956

EWER, T. K. **Vitamin D requirements of sheep.** *Austral. Vet. J.*, 1953, **29**, 310-315. [Vet. Sch., Univ. Queensland.]

In this review the etiology of rickets is discussed with special reference to sheep. The vitamin D requirement is conditioned by the amount of sunshine, the type of grazing and the amounts of Ca and P in the diet, and at the moment cannot be accurately assessed.—D. Duncan.

2957

FRANKLIN, M. C. **Vitamin D requirement of sheep with special reference to Australian conditions.** *Austral. Vet. J.*, 1953, **29**, 302-309. [Div. Animal Health Prod., C.S.I.R.O., McMaster Animal Health Lab., Sydney.]

In Tasmania there are about 18 weeks in winter when the sun's height does not exceed 35°, the altitude necessary for effective ultraviolet irradiation.

In 1947, 2 groups of 25 cull Corriedale weaned lambs grazed green oats for 15 weeks from May to August. One group received a subcutaneous injection of one million I.U. vitamin D₂ in May and in July. No difference was observed until July, but in the last 7 weeks 9 untreated lambs lost weight and 4 ceased to grow, while the treated animals continued to gain. The untreated animals showed decreasing values for serum Ca and inorganic P, and 7 developed clinical rickets. Similar results were obtained in New South Wales in 1948 and in Tasmania in 1949, but in another experiment in 1947 and in a series in 1948 there was no significant benefit to the lambs treated with vitamin D₂; the lack of difference is ascribed to differences in the grazing conditions and the weather.

The vitamin D requirements of weaned lambs and their response to vitamin D under field conditions are considered to be uncertain. Supplements are likely to be of most value when the lambs graze green crops in winter, when the grazing is good and the weather bad, and when the lambs start the winter in poor condition.—D. Duncan.

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2958

GREEN, R. J. **Some field observations on the effect of vitamin D supplements in sheep.** *Austral. Vet. J.*, 1953, **29**, 316-324 (with discussion 324-325). [Animal Health Serv., Dept. Agric., Launceston, Tasmania.]

The results are described of a number of field experiments in Tasmania in which the effect of giving sheep vitamin D₂ or D₃ by subcutaneous injection was disappointing. Sheep with clinical rickets responded well to vitamin D₂, but when rickets was not apparent there was little advantage from giving vitamin D. The same was usually true for calves also, though with both sheep and calves the treated animals sometimes had a better appearance than the untreated and in one experiment treated calves gained more weight than untreated.

Despite the rarity of dramatic response, vitamin D is considered a "cheap form of insurance" against rickets for grazing sheep in winter.

D. Duncan.

2959

DUNLOP, G. **Rickets in sheep.** *Nature*, 1954, **173**, 453. [W. Scotland Agric. Coll., Auchincruive, Ayr.]

In Ayrshire, in December 1951, of 38 ram hogs reared on low ground pasture from 4 months of age, 20 were given a single oral dose of 2 million I.U. vitamin D₂, and 18 were left untreated. Within a month the blood serum mean values, in mg. per 100 ml., for the treated and untreated, respectively, were for Ca 11.3 and 6.7, and for P more than 5 and less than 4. In spite of treatment, however, rickets began to appear, and in February 1952 all the animals were given 2 million I.U. vitamin D₂ with completely satisfactory results, normal health and growth ensuing. It is recommended that a large dose of vitamin D₂ be given to all young rams twice in the winter to ensure protection against "bent-leg".—E. M. Hume.

2960

TEULON, H. and PAULAIS, R. **Étude comparative de l'intoxication du rat par les vitamines D₂ et D₃.** [Comparative study in the rat of intoxication by vitamins D₂ and D₃.] *C.R. Soc. Biol.*, 1953, **147**, 1775-1776. [Centre Recherches Foch, Paris.]

Groups of 4 male rats weighing about 120 g. were given an intramuscular injection twice a week of 1 mg. of a hydrosol with Tween 20 of vitamin D₂ or vitamin D₃. Two rats were untreated. A group having each vitamin was killed after 14 and after 21 days. The loss of weight and the Ca content of the kidneys were the same with either vitamin.—E. M. Hume.

2961

NEUWEILER, W. Vitamin D-Hypervitaminose und Schwangerschaft. [**Vitamin D₂ excess and pregnancy.**] *Internat. Ztschr. Vitaminforsch.*, 1954, **25**, 203-204. [Frauenklin, Univ. Berne.] English and French summaries.

Guineapigs having a normal diet were given, daily, 1200 I.U. vitamin D₂. In comparison with other animals having the same diet without added vitamin D, the sexual cycle was much disturbed and the production of young delayed; in the course of 3 litters, the number of young increased from 3 or 4 to 5, and the mortality of the young increased to 48 per cent. from 5. No toxic effect was seen except on the reproductive system.

E. M. Hume.

2962

POLEMANN, G. and FROITZHEIM, G. Tierexperimentelle Untersuchungen zur Therapie der D₂-Hypervitaminose. [**Animal experiments on treatment of vitamin D₂ excess.**] *Ztschr. Vitamin-, Hormon- Fermentforsch.*, 1952-53, **5**, 329-357. [Hautklin., Univ. Cologne.] French and English summaries.

Mice weighing from 17 to 23 g. were maintained on a normal diet and given a single peritoneal dose of 5 mg. vitamin D₂. Two days later the material to be tested for its protective action was given. The animals died or were killed, and the kidneys, heart, liver, lungs, and aorta were removed. Pre-

liminary experiments showed sesame oil to be the most suitable solvent for the vitamin, and 5 mg. vitamin D₂ to be a dose which caused death in 75 per cent. of the mice within 17 days. The substances tested, given at 2-day intervals from the 2nd to the 14th day, were, in mg. per kg. body-weight, Cystein-Hormodyn (Nordmark) 75; Methionin-Thiomedon (Homburg) 1000; 2:3-Dimercaptopropanol-Sulfactin (Homburg) 50; N-Acetylcysteamine 50; N, S-Diacetyl-cysteamine 50; Rutin-Rutinon (Rheinchemie) 250. Cortisone was given to some mice in a daily dose of 10 mg. per kg. bodyweight after they had lost up to 6 g. weight. No evidence of protection by any of the substances was obtained from the survival time or the histological changes in the organs.

E. M. Hume.

2963

HENRY, K. M. and KON, S. K. **A note on the vitamin D content of Indian butters.** *J. Dairy Res.*, 1954, **21**, 81-82. [Nat. Inst. Res. Dairying, Univ. Reading.]

Three samples of butter from southern India were tested prophylactically on rats, and found to contain 0.56, 0.41 and 0.29 I.U. vitamin D per g. rendered fat. The values are comparable with those for English summer butter and much less than the values reported by Dikshit and Ranganaathan (Abst. 1643, Vol. 20) for other Indian samples.

D. Harvey.

VITAMIN E

2964

POLISTER, B. H. **Nitrosation method of determining d-γ-tocopherol.** *Anal. Chem.*, 1954, **26**, 407-408. [Sch. Med., Univ. California, Los Angeles.]

A solution of d-γ-tocopherol in dimethoxyethane was treated with acetic acid and sodium nitrite solution to form the nitroso-derivative. Potassium hydroxide was added to form the red derivative, which was then extracted with isooctane. The absorption maxima of this solution at from 450 to 350 mμ. in the visible region and from 340 to 280 mμ. in the ultraviolet region were measured with a Cary recording spectrophotometer; either of them was used for the estimation. The values obtained from a blank prepared in the same manner was subtracted from the reading. The colour was stable for 1 hr. in absence of daylight.—R. J. Ward.

2965

EGGITT, P. W. R. and WARD, L. D. **The chemical estimation of vitamin-E activity in cereal products. 1. The tocopherol pattern of wheat-germ oil.** *J. Sci. Food Agric.*, 1953, **4**, 569-

579. [Spillers, Ltd., Central Lab., Station Rd., Cambridge.]

Complete experimental details are given for estimating the individual tocopherols in wheat germ oil. The reverse phase paper chromatographic method as first described by Brown (Abst. 1525, Vol. 23), and later modified by the present authors (Abst. 4165, Vol. 23) was used for separating the tocopherols. Detailed instructions are given for removing sterols and for preparing the Floridin earth column for removal of carotenoids.

The mean tocopherol content of an ether extract of freshly milled wheat-germ meal was 2990 μg. per g. with 97 per cent. recovery of added tocopherol. The tocopherol percentage composition was origin spot 14.2, α-tocopherol 48.8, β-tocopherol 28.0 and fast spot 9.0, with a chromatogram recovery of 100 per cent. Purified ethyl ether as solvent gave an oil with a slightly higher tocopherol content than cyclohexane. After 2½ hours' extraction all the tocopherol was extracted by ether solvent and continuation of extraction gave a yield of oil which was larger but less potent.

It is suggested that the fast spot is probably 5-methyltocol or ε-tocopherol.—R. J. Ward.

N.A. and R., July 1954

2966

FARBER, M. C., MILMAN, A. E. and MILHORAT, A. T. Vitamin E-Aktivität einiger Tocopherolderivate und verwandter Substanzen. Ein Beitrag zur Kenntnis struktureller Voraussetzungen für biologische Aktivität. [Vitamin E activity of some tocopherol derivatives and related substances; a contribution to the study of the structural conditions for biological activity.] *Hoppe-Seyler's Ztschr.*, 1953, **295**, 318-323. [Dept. Psychiat., Cornell Univ. Med. Coll., New York.]

Rabbits were used to assess the antidystrophic action of several related compounds of α -tocopherol and α -tocopherylquinone. The compounds were administered by mouth or parenterally in sesame oil or in one case in a 1 : 9 solution of ethanol and propylene glycol, and were active in single doses of the amounts shown, in mg.: *dl*- α -tocopherol 5, α -tocopheryl quinone 20, α -tocopheryl hydroquinone 5, tocopheramine 20, tocopheroxide 30, trimethylphytylbenzoquinone 50, trimethyl dihydrophytyl benzoquinone 100 and mercaptotocopheryl acetate 100. α -Tocopherylorthoquinone was not active in a dose of 100 mg. daily and thiotocopheryl acetate was not active when given for 15 days in a dose of 20 mg. daily.

The structural conditions for biological activity are discussed.—R. J. Ward.

2967

MACKENZIE, J. B. and MACKENZIE, C. G. Vitamin E activity of alpha-tocopherylhydroquinone and muscular dystrophy. *Proc. Soc. Exp. Biol. Med.*, 1953, **84**, 388-392. [Div. Chem. Embryol., Univ. Colorado Sch. Med., Denver.]

α -Tocopherylhydroquinone, which is known to be effective against muscular dystrophy in rabbits (Abst. 1647, Vol. 20), was injected in the form of its disuccinate daily or every second or third day into the tail vein of pregnant rats maintained on a diet deficient in vitamin E. Even with total amounts of 128 mg. resorption of the foetuses was not prevented. When single doses of up to 100 mg. of α -tocopherylhydroquinone or its disuccinate were injected into dystrophic rabbits no increase in the concentration of tocopherol in the blood plasma could be detected 24 hr. later. α -Tocopherylhydroquinone appears therefore to be active to prevent muscular dystrophy without being converted to α -tocopherol. *dl*- α -Tocopherol always prevented foetal resorption in a dose of 3 mg. when a total dose even of 152 mg. α -tocopherylhydroquinone succinate had been without effect in the same animals.—T. Moore.

2968

COUJARD, R. and DAUM, H. Lésions du sympathique génital provoquées par l'avitaminose E.

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[Lesions of the genital sympathetic nerves produced by vitamin E deficiency.] *C.R. Acad. Sci.*, 1954, **238**, 840-842.

Histological studies were made of the uterine nerve ganglia of rats deprived of vitamin E. [Duration of the deficiency not stated.] In some of the ganglia vacuoles were seen. These were filled with coagulated material which had a weak affinity for basic stains, and their presence sometimes caused the nuclei to be flattened and displaced. It is suggested that the widely different histological effects of deficiency seen in the sex organs of males and females may be secondary to the same type of primary nerve lesion.—T. Moore.

2969

MILMAN, A. E. and MILHORAT, A. T. Metabolic patterns in experimentally induced muscular dystrophy. *Proc. Soc. Exp. Biol. Med.*, 1953, **84**, 654-660. [Dept. Psychiat., Cornell Univ. Med. Coll., New York.]

Young rabbits were kept on a diet deficient in vitamin E or were given daily injections of cortisone, and the biochemical abnormalities associated with the muscular dystrophy produced were compared. After deprivation of vitamin E for 15 days, creatine, K and Ca were greatly increased in the urine, but Na was much reduced. Cortisone caused even greater excretion of creatine, K and Ca, but the clinical signs of muscular dystrophy were less severe. Small doses of pituitary growth hormone partly counteracted the effect of cortisone, but large doses exacerbated the abnormalities. When administered in vitamin E deficiency, the growth hormone had little effect, except to increase N retention for a few days. Both cortisone and the growth hormone caused glycosuria, and when they were given together their effects were additive.—T. Moore.

2970

BLAXTER, K. L. Diet and muscular disease in calves. *Proc. Brit. Soc. Animal Prod.*, 1953, 94-100 (with discussion 100-101). [Hannah Dairy Res. Inst., Kirkhill, Ayr.]

2971

BACIGALUPO, F. A. and LUECKE, R. W. Some mineral changes in the skeletal and heart muscles of vitamin E deficient lambs. *J. Animal Sci.*, 1954, **13**, 245-248. [Michigan Agric. Exp. Stat.]

The skeletal and heart muscles of lambs in normal health, deprived of vitamin E, or given a curative dose of vitamin E, were analysed for Na, K, Ca, Mg, and P, which were in mg. per 100 g. wet muscle : Na 91, 159, 128 ; K 287, 199, 262 ; Ca 7, 42, 9 ; Mg 31, 22, 20 and P 268, 247 and 268, respectively, for skeletal muscle, and for heart

muscle: Na 120, 144, 225; K 226, 182, 295 mg.; Ca 6, 23, 9; Mg 28, 19, 25 and P 261, 343, 250 mg., respectively. It will be seen that the Ca content of the skeletal muscle and the P content of the heart muscle of vitamin-E-deficient lambs were higher than those of the controls.

R. J. Ward.

2972

CURTO, G. M. Ricerche sull'avitaminosi E sperimentale della cavia maschio. [**Experimental vitamin E deficiency in the male guineapig.**] *Acta vitaminol.*, 1954, **8**, 7-10. [Lab. Anat. Fisiol., Fac. Agrar., Univ. Milan.] French, English, German and Spanish summaries.

Twenty male guineapigs weighing about 300 g. were given a diet of, per cent., skimmed milk powder 27, bran 16, chaff 22, dextrin 12, linseed cake 5, coconut cake 5, groundnut cake 4, and brewer's yeast 2, all treated with ultraviolet light to destroy tocopherols, mineral salts 2, and rancid fat 5; 2 drops tunny liver oil and 5 mg. vitamin C were given daily. Ten guineapigs received normal diet. After 180 days the animals were killed, and histological examination showed the testicular changes characteristic of vitamin E deficiency in rats.—E. M. Hume.

2973

DAVIS, C. L. and GORHAM, J. R. **The pathology of experimental and natural causes of "yellow fat" disease in swine.** *Amer. J. Vet. Res.*, 1954, **15**, 55-59. [Branch Pathol. Lab., Bur. Animal Indust., U.S. Dept. Agric., Denver, Colo.]

Histological studies were made on the yellowish fatty tissues and visceral organs of 10 pigs which had been fed experimentally on fish scraps. The animals did not thrive and some of them died. The fat only from 4 carcasses which had been condemned at slaughter-houses was examined also. Discolouration of the fat was accompanied by a fishy odour of the flesh. In the interstices of the adipose tissues of both experimental and condemned animals, microscopical examination revealed the presence of globules of foreign fat, some of which were acid-fast. The acid-fast material was found also in the Kupffer cells of the liver. Supplements of vitamin E allowed the pigs to thrive, and the discolouration of fat was reduced but not completely prevented by the amounts given.

T. Moore.

2974

HOVE, E. L. **The toxicity of tri-*o*-cresyl phosphate for rats as related to dietary casein level, vitamin E and vitamin A.** *J. Nutrition*, 1953, **51**, 609-622. [Dept. Animal Husb., Agric. Exp. Stat., Alabama Polytech. Inst., Auburn.] The growth of rats given a diet deficient in vitamin E and containing 20 per cent. casein was

slowed by the addition of 0.1 per cent. tri-*o*-cresyl phosphate. The cresyl phosphate also further decreased the subnormal growth obtained when the diet contained only 10 per cent. casein, but with 60 per cent. casein there was no depression. The depression of growth caused by cresyl phosphate or deficiency of protein was only partly corrected by 1 or 10 mg. α -tocopherol daily.

The composition of the fat in the liver, brain and carcass of selected rats was studied by several methods, including spectroscopic estimation of conjugated dienes as a measure of peroxide formation. Cresyl phosphate increased the conjugated dienes and other signs of oxidation, but tocopherol or a larger supply of casein had the opposite effect. Cresyl phosphate decreased the concentration of tocopherol in the tissues, and the accumulation of vitamin A reserves in the liver of animals given β -carotene or vitamin A acetate.

In vitro, the presence of cresyl phosphate, carbon tetrachloride, pyridine or pentachloronaphthalene increased the destruction of carotene by fat peroxides. Limited data suggested that chloronaphthalene poisoning in cattle is associated with reduction in the concentration of vitamins A and E in the plasma.—T. Moore.

2975

BARGONI, N., CAFIERO, M., DI BELLA, S. and GRILLO, M. A. Relazione del tocoferolo e dell'axeroftolo con alcuni enzimi del fegato di ratti a dieta carente di protidi. [**Relation of tocopherol and vitamin A to certain enzymes of the liver in rats on a diet deficient in protein.**] *Boll. Soc. ital. Biol. sper.*, 1953, **29**, 1144-1146. [Ist. Chim. Biol., Univ. Turin.]

2976

RICHERT, D. A. and WESTERFELD, W. W. **Vitamin E deficiency and xanthine oxidase in rabbits.** *Proc. Soc. Exp. Biol. Med.*, 1953, **84**, 468-470. [Dept. Biochem., Med. Coll. State Univ. New York, Syracuse.]

Rabbits were given a diet deficient in vitamin E until they developed muscular dystrophy. Others were given an adequate diet of chow, or the deficient diet with supplements of mixed tocopherols. Estimation of xanthine oxidase in the liver in the presence or absence of methylene blue showed the activity to be much greater in the deficient than in the normal animals. The slight activity in the intestines was not increased in vitamin E deficiency, and no activity was detected in the heart, lung, kidney, spleen, brain or skeletal muscle of any animals. The content in the tissues of Mo, which has been reported to be concerned in the xanthine oxidase system, was influenced by varying the Mo content of the diet, but not by the presence or absence of vitamin E.—T. Moore.

N.A. and R., July 1954

2977

FORBES, M., BARNES, L. A., MOEKSI, H. and GYÖRGY, P. **Excretion of ether-soluble acids by rats on necrogenic diet with and without supplements of antibiotics.** *Proc. Soc. Exp. Biol. Med.*, 1953, **84**, 162-165. [Dept. Paediat., Sch. Med., Univ. Pennsylvania, Philadelphia.]

Weanling rats were kept on a diet designed to produce liver necrosis. Supplements of aureomycin, penicillin or vitamin E caused no quantitative alteration in the urinary excretion of ammonia, urea N, creatinine, hippuric acid or *p*-aminobenzoic acid. Most rats on the unsupplemented diet died of liver necrosis after between 30 and 60 days, but in the few survivors and in the animals receiving vitamin E the urinary excretion of ether-soluble acids was significantly higher than in the rats treated with aureomycin or penicillin. Chromatograms showed that methylmalonic acid formed the largest part of the total ether-soluble acid in the untreated or vitamin-E-treated animals, but in rats treated with antibiotics $\alpha\alpha$ -dimethylsuccinic acid and an unidentified acid with $R_F = 0.80$ formed the largest part of the acid excretion, with a smaller proportion of methylmalonic acid. An unidentified acid with $R_F = 0.45$ occurred in the urine of almost all the rats treated with antibiotics and of a few untreated or treated with vitamin E.—M. B. Richards.

2978

LA GRUTTA, G. and CILENTO, A. **Vitamina E e metabolismo glicidico. [Vitamin E and carbohydrate metabolism.]** *Boll. Soc. ital. Biol. sper.*, 1953, **29**, 408-410. [Ist. Fisiol., Univ. Palermo.]

No effect of vitamin E was observed on the R.Q. or energy expenditure of rats made diabetic with alloxan, on the glycogen content of the liver or skeletal or heart muscle of normal rats and rats made diabetic with alloxan, or on the acid-soluble P content of the blood, with or without administration of glucose, of normal rabbits and rabbits made diabetic with alloxan, or on the fatty livers of rabbits made diabetic with alloxan.

E. M. Hume.

2979

LA GRUTTA, G. and CILENTO, A. **Metabolismo glicido e vitamina E. 1. Dispendio energetico e quoziente respiratorio in ratti allossanati e trattati con vitamina E. [Carbohydrate metabolism and vitamin E. 1. Energy expenditure and respiratory quotient in rats with alloxan diabetes treated with vitamin E.]** *Boll. Soc. ital. Biol. sper.*, 1953, **29**, 1084-1085. [Ist. Fisiol., Univ. Palermo.]

See preceding Abst.

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2980

MASURE, R., DE STOOP, P. and SOLVAY, H. **L'action de la vitamine E sur le temps de saignement du lapin. [Action of vitamin E on bleeding time in the rabbit.]** *Rev. belg. Pathol. Méd. exp.*, 1953, **23**, 102-110. [Clin. Méd. A., Univ. Louvain.]

Repeated observations were made on the times taken for the fine blood vessels of rabbits' ears to stop bleeding under water after experimental cuts. The administration of disodium α -tocopheryl phosphate by mouth or intramuscular injection decreased the time of bleeding. α -Tocopheryl acetate also, when injected, accelerated haemostasis, but by mouth prolonged bleeding. When intravenous injections of calcium gluconogalactogluconate were given in addition to tocopherol, the time of bleeding 15 min. after the last injection of Ca salt was always prolonged. Irregular results were obtained when the observations were postponed for longer after the injection of the Ca salt.

T. Moore.

2981

MALDONADO VELIZ, M. A. **Acción de los tocoferoles sobre la ascorbinemia en conejos. [Effect of tocopherols on blood ascorbic acid in rabbits.]** *An. Fac. Farm. Bioquim., Lima*, 1952, **3**, 296-311. [Lab. Farmacol., Univ. Lima.]

Changes in blood ascorbic acid, estimated by indophenol titration with a colorimeter, were studied in rabbits receiving from 50 to 1200 mg. α -tocopherol given orally or by intraperitoneal injection. In general, male rabbits showed a greater increase in blood ascorbic acid than females. The increase was greater in both sexes when the tocopherol was given orally. The results are shown in a series of graphs from which it can be deduced that the effect of a dose of tocopherol on the values for blood ascorbic acid reached its maximum within 24 hr., after which the values fell to the original level.

A. M. Copping.

2982

HALEY, T. J., McCULLOH, E. F. and McCORMICK, W. G. **Influence of water-soluble vitamin E on survival time in irradiated mice.** *Science*, 1954, **119**, 126-127. [Div. Pharmacol., Atomic Energy Project, Sch. Med., Univ. California, Los Angeles.]

Groups of mice, of bodyweight about 20 g., were injected intramuscularly with saline, or with water-soluble preparations containing 0.5, 1.0, 2.0 or 3.18 mg. α -tocopherol. The animals were submitted to lethal X-ray exposure on a single occasion and the injections were continued daily until most of them had died. Tocopherol in the two lower doses had no effect on the survival time of the mice but,

contrary to expectation, significantly shortened life in the two higher doses. [The possible toxicity of the higher doses without X-ray exposure does not appear to have been studied.]-T. Moore.

2983

BEILER, J. M., SWAYNE, V. R., MENAKER, J. and MARTIN, G. J. **Anti-fertility activity of *Pisum sativum*.** *Exp. Med. Surg.*, 1953, **11**, 179-185. [Res. Labs., Nat. Drug Co., Philadelphia, Pa.]

In view of the reports of Sanyal (Absts. 288, Vol. 21; 2621, Vol. 22), an investigation into the effects of *Pisum sativum* was made on white mice of the Webster strain. Ground peas were mixed with Purina chow as 10, 20 or 30 per cent. and the diets were given for a week before mating. With 30 per cent. the diet proved toxic, and 6 of 10 male mice and 4 of 20 female died within 12 days. Changes were found in the reproductive organs of the surviving males. With 20 per cent. of peas, 14 out of 20 females produced normal young, and with 10 per cent., 15 of 20 produced litters. Vitamin E was added to the diet of 8 of the remaining 16 females having 30 per cent.; after 28 days no pregnancy occurred and 3 of the 8 without vitamin E had died. All

the animals were killed and there was increased vascularity of the uterus and ovaries in those without vitamin E. Those having vitamin E showed no abnormality of the uterus or ovaries. In tests with ether extracts of peas dissolved in arachis oil 6 pregnancies were obtained from 9 mice, while of 9 receiving only the arachis oil 8 became pregnant. The problem of separating the antifertility effect from the toxic effect is discussed.

A. M. Copping.

2984

RUCCIA, D. Ricerche sull'eventuale presenza di vitamina E nell'olio di oliva. [Possible presence of vitamin E in olive oil.] *Boll. Soc. ital. Biol. sper.*, 1953, **29**, 397-400. [Ist. Fisiol., Univ. Bari.]

Rats of both sexes weighing from 105 to 140 g. were maintained for 50 days on the diet No. 232 of Evans and Burr, deficient in vitamin E, with or without inclusion of olive oil of different degrees of refinement. When they were mated with non-deprived animals of the opposite sex there was no evidence of fertility. The amount of olive oil consumed daily was from 2 to 3 g. (See also Abst. 357, Vol. 24.)-E. M. Hume.

See also Abst. 3220.

VITAMIN K

2985

ISLER, O., RÜEGG, R., STUDER, A. and JÜRGENS, R. Konstitutionsspezifische Wirkung von Vitamin K₁ und Analogen gegen Cumarin-Verbindungen. [Chemical constitution and the antagonism of vitamin K₁ and its analogues to coumarol compounds.] *Hoppe-Seyler's Ztschr.*, 1953, **295**, 290-309. [Wissenschaftl. Lab., Hoffmann-La Roche Co. A.G., Basle.]

A brief note is given of the synthesis and chemical nature of 24 analogues of vitamin K which were tested for their capacity to shorten prothrombin time in rabbits given dicoumarols or promote survival in rats given toxic doses of dicoumarol derivatives. Certain of the vitamin K compounds and of the dicoumarols appeared to have different effects for rabbits and rats. Vitamin K₁ was active for both species against all types of dicoumarol. The activity of other vitamin K analogues depended on the structure of the molecule. The presence of a side-chain like that in vitamin K₁ or K₂ gave fullest activity. The presence of methyl groups and double bonds in the side-chain helped the activity, but appeared not to be essential; short side-chains of less than 8 C atoms gave inactive compounds.

A. M. Copping.

2986

MARTIUS, C. and NITZ-LITZOW, D. Über den Nachweis einer Wirkung von Vitamin K₁ *in vitro* auf die oxydative Phosphorylierung. [Demonstration of an action of vitamin K₁ *in vitro* on oxidative phosphorylation.] *Biochim. biophys. Acta*, 1954, **13**, 289-290. [Physiol. Chem. Inst., Univ. Würzburg.]

Oxidative phosphorylation *in vitro* was low in liver mitochondria from chicks deprived of vitamin K. A marked increase occurred when vitamin K₁ in a concentration of 10⁻⁵ or 10⁻⁶, was added to the mitochondria, but not when 2-methyl-1:4-naphthaquinone was added. If chicks were given 50 µg. vitamin K₁ orally 24 hr. before they were killed, addition of the vitamin to mitochondria preparations had no effect on phosphorylation.

A. M. Copping.

2987

QUICK, A. J., HUSSEY, C. V. and COLLENTINE, G. E. (Jr.) **Vitamin K requirements of adult dogs and the influence of bile on its absorption from the intestine.** *Amer. J. Physiol.*, 1954, **176**, 239-242. [Dept. Biochem., Sch. Med., Marquette Univ., Milwaukee, Wis.]

Vitamin K requirement was studied in dogs after cholecystonephrostomy. The exclusion of

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bile from the intestine prevented absorption of vitamin K. The deficiency could be overcome by giving very large amounts of bile with food or by injection of vitamin K. A normal level of prothrombin could be maintained with a daily injection of 0.5 μ g. vitamin K₁ per kg. bodyweight. Doses of 5000 μ g. vitamin K₁ given orally raised the prothrombin value in the blood even when no bile was administered.—A. M. Copping.

2988

SAYAO LOBATO, A. and CARVALHO, O. Action de la vitamine K sur l' "Hemophilus pertussis". [Effect of vitamin K on *Haemophilus pertussis*.] *Presse Méd.*, 1954, **62**, 421-422. [Matern. Esc., Univ. Brazil, Rio de Janeiro.]

Addition of a water-soluble preparation of vitamin K to the culture medium had no inhibitory effect on the growth of *Haemophilus pertussis*. Samples of blood from 4 subjects given vitamin K

daily for 6 days exercised a bacteriostatic effect on the cultures.—L. Wills.

2989

CIMINO, G. L'azione delle antivitamine K sulla sintesi di vitamine da parte del *Lactobacillus arabinosus*. [Action of K antivitamins on the synthesis of vitamins by *Lactobacillus arabinosus*.] *Boll. Soc. ital. Biol. sper.*, 1953, **29**, 664-667. [Ist. Patol., Univ. Catania.]

Vitamin B₁, riboflavin, and folic acid were estimated in cultures of *Lactobacillus arabinosus* 17/5 in a medium devoid of the vitamins and containing or not containing 2-chloro-1:4-naphthaquinone or 2:3-dichloro-1:4-naphthaquinone, both antagonists of vitamin K. Synthesis of vitamin B₁ was promoted by both substances in suitable concentrations. The effect on production of riboflavin was doubtful and on that of folic acid negative.

E. M. Hume.

VITAMIN B COMPLEX: GENERAL

2990

FRÖBRICH, G. and OFFHAUS, K. Der qualitative Vitamintest mit dem Reismehlkäfer *Tribolium confusum* Duv. (Tenebrionidae, Coleoptera) als Testorganismus. [Qualitative vitamin test with the rice-meal beetle, *Tribolium confusum*, Duv. (Tenebrionidae, Coleoptera) as test organism.] *Ztschr. Vitamin-, Hormon-Fermentforsch.*, 1952-53, **5**, 358-369. [Zool. Inst., Munich.] French and English summaries.

Basal diets containing vitamin-free casein, glucose and a salt mixture, with suitable vitamin supplements, gave satisfactory results in qualitative tests for vitamin B₁, riboflavin, vitamin B₆, nicotinic acid, nicotinamide, pantothenic acid, biotin and folic acid, with larvae of *Tribolium confusum*. A diet containing rice starch and a mixture of amino-acids was used successfully in some tests, but with folic acid the results appeared to depend on the purity of the starch.

A. M. Copping.

2991

MACCACARO, G. A. Il dosaggio microbiologico di aminoacidi e vitamine secondo un nuovo criterio. [Micrological estimation of amino-acids and vitamins with a new criterion.] 1. Presupposti matematici. [1. Mathematical premises.]

MACCACARO, G. A. and LUGLI, A. M. 2. Il dosaggio della metionina. [Estimation of methionine.] *Boll. Soc. ital. Biol. sper.*, 1953, **29**, 1055-1058; 1059-1062. [Ist. Igiene Microbiol., Univ. Pavia.]

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1. The method is that of measuring the diameter of colonies of the test organism grown on a solid medium containing different concentrations of the test substance. The relation of colony size to the concentration is examined mathematically.

2. A practical example is given of estimation of methionine with a strain of *Bacterium coli* grown on an agar medium.—E. M. Hume.

2992

KOSER, S. A. and THOMAS, J. L. Activity of some vitamin derivatives and related compounds for oral lactobacilli. *J. Infect. Dis.*, 1953, **93**, 192-199. [Walter G. Zoller Mem. Dent. Clin., Chicago, Ill.]

Growth was estimated turbidimetrically of 15 strains of oral lactobacilli, 10 of the homofermentative type, 5 of the heterofermentative type, and of *L. casei*, *L. arabinosus*, *L. fermenti* and *L. acidophilus* from laboratory stock, on a casein-digest medium previously described (Abst. 295, Vol. 21) in which indispensable, individual vitamins were replaced by a derivative or related compound.

Of the biotin substitutes, oxybiotin in small amounts supported vigorous growth, the response being a little slower on occasion than to biotin. Desthiobiotin, even in large amounts, gave a slow and poor response in about a third of the cultures and none in the others; norbiotin and biotinol had a thousandth of the activity of biotin but could support good growth; homobiotin was much less active.

The derivatives of nicotinic acid, which included isonicotinic, picolinic and quinolinic acids, were almost inactive. Nicotinylnitrate, monoethylamide and

to a less extent the diethylamide, and 3-pyridine methanol in fairly large amounts, supported moderate growth of most strains. It is, however, considered possible that these substances were contaminated with nicotinic acid. Four other derivatives and two pyrazine carboxylic acids were completely inactive.

Pantothenic acid could not be replaced by Na pantoate, β -alanine or pantolactone, separately or in combination, or by panthenol, which sometimes inhibited growth.

Only the heterofermentative group required vitamin B₁ for growth, and for most of them the thiazole moiety supported growth which was slower but ultimately comparable with that promoted by the vitamin. The pyrimidine moiety did not support growth.

Where a vitamin substitute supported growth the pH of the cultures was lowered to an extent comparable with the degree of turbidity.

V. R. Jackson.

2993

PLANCHART, A. Papel biológico de las vitaminas. Observaciones generales sobre algunas vitaminas consideradas como coenzimas. [Biological role of the vitamins. General notes on some vitamins regarded as co-enzymes.] *Arch. venezol. Nutricion*, 1953, 4, 5-28. [Inst. Nac. Nutric.] English and German summaries. A lecture review.

2994

ALMQUIST, H. J. Application of the law of diminishing returns to estimation of B-vitamins requirements for growth. *Poultry Sci.*, 1953, 32, 1001-1003. [Grange Co., Modesto, Calif.]

It is suggested that the vitamin requirements of young animals can be calculated from feeding experiments with graded amounts of the vitamin more accurately by plotting the response against the logarithm of the dose than against the dose itself.

In the examples shown the response at amounts below the requirement was linear, and the point of intersection with a horizontal line through the maximum response then gave a more exact estimate of the requirement than inspection of the direct response curve usually plotted.

K. J. Carpenter.

2995

RUBINO, F. and GIACALONE, O. Influenza delle vitamine B₁ e B₂ sui processi ricostruttivi nella rialimentazione dopo digiuno. [Influence of vitamin B₁ and riboflavin on the processes of reconstruction during refeeding after a fast.] Influenza dell'acido pantotenico sui processi ricostruttivi nella rialimentazione dopo digiuno. [Influence of pantothenic acid on the

processes of reconstruction during refeeding after a fast.] *Boll. Soc. ital. Biol. sper.*, 1953, 29, 975-978; 978-980. [Ist. Fisiol., Univ. Palermo.]

Three groups of 5 adult male rats were starved till they had lost about 18 per cent. of their weight, and then were fed on a diet containing, per cent., rice starch 65, lactic casein 20, butter 10, Osborne and Mendel salt mixture 5, and adequate vitamins. In addition one group received daily by mouth 2.5 mg. vitamin B₁, another 1 mg. riboflavin, and the third had no addition. The groups in the above order regained their initial weight in a mean time of 16.6, 19 and 28.2 days, and used, per g. weight increase, 0.404, 0.406 and 0.422 Cal.

In a similar experiment one group daily received 100 mg. pantothenic acid during recovery and another had no addition. The treated group recovered its initial weight in a mean time of 10.5 days and the untreated in 12.5, with Cal. consumptions per g. weight increase of 0.268 and 0.279.

E. M. Hume.

2996

MYBURGH, S. J. and GROENEWALD, J. W. The influence of enrichment of maize meal on the growth of rats. *Onderstepoort J. Vet. Res.*, 1953, 26, 235-239. [Onderstepoort Lab.]

In paired feeding tests 4 groups of 6 adolescent albino rats were given a basal diet containing whole white maize meal or white processed maize flour, with or without addition to each 100 g. of maize meal or flour of 244 mg. of a concentrate containing in mg. per lb. vitamin B₁ mononitrate 388, riboflavin 240, nicotinic acid 2800, and reduced Fe 2400 with calcium phosphates. The basal ration contained, per cent., the maize flour or maize meal enriched as just described or not enriched 60, ethanol-extracted casein 15, sucrose 20, salts 2, maize oil 2, fish liver oil 1, cystine 0.1, with wheat germ oil 0.5 mg. daily, and, per 100 g. ration, pyridoxine 0.25 mg., Ca pantothenate 2.0 mg., choline chloride 100 mg., inositol 10 mg., 2-methyl-naphthaquinone 0.1 mg., and folic acid 11.5 μ g. [The length of the experiment is not stated.] The groups receiving the enriched maize products made significantly greater weight increases than those receiving the non-enriched products.—W. M. Deans.

2997

ŁUCZAKOWA, M. J. Wpływ żywienia krów na zawartość witamin B₁ i B₂ w mleku. [Influence of feeding on the vitamin B₁ and riboflavin content of milk.] *Rocz. Państwowego Zakł. Hig.*, 1953, No. 4, 513-520. Russian and English summaries.

The vitamin B₁ and riboflavin content of 115 samples of milk, estimated at different seasons of the year, was, respectively, in μ g. per cent.,

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winter 46.2 and 129.9, summer 54.7 and 156.2, autumn 64.4 and 166.9. It is suggested that 1½ pints of milk daily is sufficient to meet the riboflavin requirement of a 1-year-old infant and the vitamin B₁ requirement also during the summer and autumn, but only 25 per cent. of the requirement during the winter months. (From summary.) J. S. Thomson.

2998

HOEFLAKE, H. **An investigation into the riboflavin, nicotinic acid, pantothenic acid and biotin contents of Dutch market milks, determined by the microbiological method.** *Nederlands Melk Zuiveltijdschr.*, 1953, 7, 227-239. [Lab. Inspectorate Law Commodities, Dordrecht.] Dutch summary.

Samples of bulked morning and evening milk were collected at regular intervals from July 1948 to July 1949 in the districts of Alblasserwaard and the Isle of Dordrecht. Riboflavin, nicotinic and pantothenic acids, and biotin were estimated in the raw and pasteurised milk and occasionally in sterilised milk or buttermilk, by the microbiological methods described by Barton-Wright (*Practical methods for the microbiological assay of the vitamin B complex and essential amino acids*, Ashe Laboratories, London, 1946).

About 10 per cent. of the riboflavin content of milk was bound, probably to protein, and was liberated at pasteurisation temperature, so that values were apparently higher after pasteurisation. Values for riboflavin content increased with increasing amounts of milk in the test medium, so that average figures could not be given. Riboflavin content of milk was considerably less in winter with the cows indoors than in summer with the cows on pasture.

There was a slow decrease in nicotinic acid content during winter to a minimum of 70 µg. per 100 ml. in March. The value rose to a maximum of 101 in May and then fell to the normal of from 80 to 85, the yearly average being 82 for raw milk and 82.5 for pasteurised.

Biotin content varied greatly between cows and between samples from individual cows; a slow decrease occurred from autumn to spring. The yearly average was 20.4 µg. per litre.

Pantothenic acid content also varied considerably, with particularly low values in August and September. The yearly average was 2.9 µg. per ml. for raw and 2.95 for pasteurised milk.

There appeared to be no loss of any of the vitamins during sterilisation.

The riboflavin and pantothenic acid values for buttermilk did not differ greatly from those for raw milk, but those for nicotinic acid and biotin were considerably less, suggesting decomposition by the bacteria used in preparing buttermilk.

V. R. Jackson.

2999

FRENCH, R. B., ABBOTT, O. D. and TOWNSEND, R. O. **Levels of thiamine, riboflavin and niacin in Florida-produced foods.** *Florida Agric. Exp. Stat. Bull.* No. 482, August 1951, pp. 19.

Vitamin B₁, riboflavin and nicotinic acid were estimated microbiologically in the edible portion of 25 fruits, 4 vegetables, 5 nuts, 10 wild greens, and other products of Florida. Comprehensive tables of the results are given including varietal differences, and one relating average servings to recommended daily requirements of vitamins. Suggestions are made to simplify the technique of the methods used.

Fruits were low in all 3 vitamins; the highest values for nicotinic acid were found in avocado pear, banana, canistel, guava, tamarind and passion fruit. Passion fruit contained a moderate amount of riboflavin.

Green leafy vegetables were good sources, especially collards. Of plants grown as feed for stock, clovers were best. Swede turnip, carrot, and potato and sweet potato had moderate values for vitamin B₁ and nicotinic acid. Seed crops had better balanced contents of vitamins; green lima beans and English peas were particularly rich in vitamin B₁ and nicotinic acid, and summer squash in nicotinic acid.

Coconut had low values; peanuts were high in vitamin B₁, pecan nuts in riboflavin and both in nicotinic acid. Water oak acorns for pigs were high in nicotinic acid and carotene, fair in riboflavin. Peanuts, on roasting, lost a considerable amount of vitamin B₁ but not of the other vitamins.

Among other foods, pork was high in vitamin B₁ and nicotinic acid, and a diet of maize gave a higher content of vitamin B₁ than one in which 40 per cent. of the maize was replaced by cane or citrus molasses.

Ten species of fish were examined and found high in nicotinic acid. Eggs and milk were good sources of riboflavin. Short-time pasteurisation or homogenisation of milk caused no loss.

V. R. Jackson.

3000

BANERJEE, S., ROHATGI, K. and LAHIRI, S. **Pantothenic acid, folic acid, biotin and niacin contents of germinated pulses.** *Food Res.*, 1954, 19, 134-137. [Dept. Physiol., Presidency Coll., Calcutta.]

Seeds of *Lathyrus sativus*, *Phaseolus mungo*, *Pisum sativum*, *Cajanus indicus*, *Ph. radiatus*, *Cicer arietinum* and *Lens esculenta* were germinated out of direct sunlight for from 2 to 4 days at 30° C. Before and after germination pantothenic, nicotinic and folic acids and biotin were estimated microbiologically.

The nicotinic acid content of all the pulses and the biotin content of all but *L. sativus* increased

during germination. Pantothenic acid increased in *L. sativus*, *Ph. mungo*, *C. indicus* and *C. arietinum* and remained unchanged in the others. Folic acid values decreased in all.

Tables of values are given. Germinated pulses are recommended as food.—V. R. Jackson.

3001

HALL, A. P., WHEELER, P., THIELEN, A. and MORGAN, A. F. **A new B vitamin study of walnuts.** *Food Res.*, 1953, **18**, 574–577. [Agric. Exp. Stat., Univ. California, Berkeley.]

Vitamin B₁ was estimated by the thiochrome method, and riboflavin, vitamin B₆ and nicotinic, pantothenic and folic acids microbiologically, in the 1950 and 1951 crops of walnuts (*Juglans regia*) grown in California. Three varieties were studied, Payne, Placentia and Franquette, and values are compared with those obtained in earlier work (Abst. 397, Vol. 19).

Values in mg. per 100 g. were for vitamin B₁ 0.24 to 0.28, riboflavin 0.12 to 0.17, nicotinic acid 0.86 to 1.23, pantothenic acid 0.49 to 0.95, folic acid 0.13 to 0.23 and vitamin B₆ 0.87 to 1.05. Nicotinic acid values were 40 to 60 per cent. higher in the second study with an improved method of extraction; those for vitamin B₁ and riboflavin agreed. Rat growth methods of estimation gave for pantothenic acid a value of 1.09, for vitamin B₆ one similar to that obtained microbiologically. Payne and Placentia varieties had a significantly higher content of all 6 vitamins than the Franquette variety. No difference was found between values for the 2 crops except that pantothenic acid values were higher in 1951 than in 1950.—V. R. Jackson.

3002

FANG, S. C., BULLIS, D. E. and BUTTS, J. S. **Investigation of Barcelona and Du Chilly filbert nuts. 3. Amino acid and B vitamin contents of oil-free filbert nut meals.** *Food Res.*, 1953, **18**, 555–559. [Dept. Agric. Chem., Agric. Exp. Stat., Oregon State Coll.]

For previous paper see Abst. 1559, Vol. 20.

Barcelona and Du Chilly filbert nuts (*Corylus avellana*) of the 1946–48 crops were extracted with light petroleum and ground to a fine powder. Amino-acids and 6 B vitamins were estimated microbiologically. The meals were examined as sources of protein for young rats given the diet of Bubl and Butts (Abst. 4601, Vol. 18) except that 16.5 per cent. of intact protein was used and cellulose was omitted from diets containing nut meal.

Of the 17 amino-acids examined, the percentage of valine, proline, serine, aspartic acid and lysine was slightly higher, of methionine the same, and of cystine, threonine and tryptophan lower, in the filbert nut meals than in filbert nut globulins (Abst. 1559, Vol. 20). Compared with casein, the meals were high in arginine and serine, and low in lysine, proline, tyrosine and methionine. It is considered that the balance of amino-acids was good for a plant protein. The growth of young rats showed that the protein was good but inferior to casein. Supplements of tryptophan, cystine and lysine, especially of the last, caused improvement.

The meals were rich in B vitamins, especially biotin. A table is given comparing the values with those for other natural protein foods.

V. R. Jackson.

VITAMIN B₁ (ANEURIN, THIAMINE)

3003

BALKRISHNAN, S. and RAJAGOPALAN, R. **Intestinal thiamine synthesis as influenced by different fats.** *Indian Med. Gaz.*, 1953, **88**, 575–576. [Dept. Biochem., Indian Inst. Sci., Bangalore 3.]

Three comparable groups each of 6 rats were maintained for 4 weeks on a diet of vitamin-free casein, lactose, salt mixture and butterfat or coconut oil or groundnut oil. Each rat received in addition supplements of vitamins A and D and of the vitamin B complex. The rats receiving butterfat grew better, excreted more vitamin B₁ in the urine and faeces, had a higher content of vitamin B₁ in the liver, and in the faeces a higher bacterial count, both total and coliform, than the rats on coconut or groundnut oil.

L. Wills.

3004

CACIOPPO, F., LO CASCIO, S. and LAURICELLA, S. **Condensazione della tiamina da parte di tessuti animali. [Condensation of vitamin B₁ by animal tissues.]** *Boll. Soc. ital. Biol. sper.*, 1953, **29**, 526–528. [Ist. Fisiol., Univ. Palermo.]

Homogenates of the kidney or liver of rabbits synthesised vitamin B₁ *in vitro* from 4-methyl-5-β-hydroxyethylthiazole and 2-methyl-4-amino-5-aminomethylpyrimidine or 2-methyl-4-amino-5-chloromethylpyrimidine.

In the same conditions, homogenates of rat liver or kidney had no activity.—E. M. Hume.

3005

CACIOPPO, F. and LO CASCIO, S. **Ricerche sulla eventuale possibilità di sintesi della aneurina**

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da parte dei colombi. [Ultimate possibility of vitamin B₁ synthesis by pigeons.] *Boll. Soc. ital. Biol. sper.*, 1953, **29**, 1086-1087. [Ist. Fisiol., Univ. Palermo.]

Of 32 adult pigeons fed on polished rice, 8 were given no supplement, 6 were given a daily oral dose of 100 μ g. 2-methyl-4-amino-5-methylpyrimidine hydrochloride together with 100 μ g. 4-methyl-5- β -hydroxyethylthiazole, 6 were given the same by intramuscular injection, 6 were given orally daily 500 μ g. 2-methyl-4-amino-5-amino-methylpyrimidine hydrochloride together with 500 μ g. 4-methyl-5- β -hydroxyethylthiazole, and 6 received the same by intramuscular injection. The supplements had no effect on the course of vitamin B₁ depletion.

In contrast with previous findings with rabbit kidney and liver (see preceding Abst.) there was no synthesis of vitamin B₁ *in vitro* from 2-methyl-4-amino-5-chloromethylpyrimidine and 4-methyl-5- β -hydroxyethylthiazole by homogenates of liver or kidney from normally fed pigeons.—E. M. Hume.

3006

GOETHART, G. The occurrence of free thiamine pyrophosphate in the soluble fraction of rat liver homogenate. *Biochim. biophys. Acta*, 1954, **13**, 138-139. [Lab. Physiol. Chem., Univ. Utrecht.]

A soluble fraction of rat liver was prepared by centrifuging a homogenate in sucrose solution. Free vitamin B₁ pyrophosphate was estimated manometrically in 2 portions of the supernatant fluid at pH 6.2, one of which had been previously boiled at pH 3 to liberate any vitamin B₁ pyrophosphate bound to protein. The results ranged from 1.3 to 1.6 μ g. per ml. soluble fraction without boiling, and from 1.2 to 1.3 after boiling, and suggested that the vitamin B₁ pyrophosphate occurred in the free state in the cell fluid.

The soluble fraction was passed for 1 hr. at 4° C. through a protein-tight collodion filter, and pyrophosphate was estimated in the original fraction and in the ultrafiltrate. A larger proportion was found in the ultrafiltrate than in the unfiltered fraction, again indicating that a large proportion of vitamin B₁ pyrophosphate occurred free in the cytoplasmic fluid of the cells.

It is presumed that though this form is liable to decomposition by phosphatase in the living cell, it is resynthesised at an equal rate by re-phosphorylation of the vitamin B₁ formed.—V. R. Jackson.

3007

SILIPRANDI, D. and LAVIANO, F. The level of blood cocarboxylase after administration of thiamine and its phosphoric esters. *Experientia*, 1953, **9**, 420-421. [Inst. Biol. Chem., Univ. Rome.] French summary.

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Six dogs receiving a standard diet were given at weekly intervals intravenous injections per kg. bodyweight of 3 mg. vitamin B₁, 4 mg. monophosphothiamine, 5 mg. diphosphothiamine and, finally, 6 mg. triphosphothiamine. Blood carboxylase, estimated by the method of Westenbrink (Title 330, Vol. 20) at intervals during the 24 hr. after each injection, was greatly increased after administration of vitamin B₁ or monophosphothiamine, the maximum value being reached after 2 hr. There was a sharp increase immediately after di- or triphosphothiamine was given, but values were not as high between the first and third hours as after vitamin B₁ or monophosphothiamine. It was evident that the phosphoric esters were more effective than vitamin B₁ in maintaining a high concentration of cocarboxylase in the blood for 24 hr. It was shown that triphosphothiamine was not split at once into monophosphothiamine and pyrophosphate *in vivo* as it is *in vitro* (Viscontin *et al.*, *Helv. chim. Acta*, 1949, **32**, 1478).

V. R. Jackson.

3008

ROSSI FANELLI, A., SILIPRANDI, N., FASELLA, P., SILIPRANDI, D. and SALVETTI, F. L. Ricerche sulla fosforilazione *in vivo* della tiamina. [Phosphorylation of vitamin B₁ *in vivo*.] *Boll. Soc. ital. Biol. sper.*, 1953, **29**, 961-962. [Ist. Chim. Biol., Univ. Rome.]

Adenosinetriphosphate containing ³²P was prepared from the muscles of a rabbit which had previously had radio-active Na phosphate injected intravenously. Rats weighing 200 g. were injected intravenously with, per kg. bodyweight, the radio-active adenosinetriphosphate 30 mg. and vitamin B₁ 20 mg. The rats were killed 30 or 60 min. later and, in extracts of the liver, the mono-, di- and triphosphates of vitamin B₁ were isolated chromatographically. Localisation of ³²P showed it to be present in the di- and tri- but not in the monophosphate.—E. M. Hume.

3009

ROSSI-FANELLI, A., SILIPRANDI, N., FASELLA, P., SILIPRANDI, D. and SALVETTI, M. On the phosphorylation of thiamine in the living animal. *Experientia*, 1954, **10**, 73-74. [Inst. Biochem., Univ. Rome.]

See preceding Abst.

3010

BARTLEY, W. Metabolism of thiamine phosphates in washed suspensions of kidney particles. *Biochem. J.*, 1954, **56**, 379-387. [Dept. Biochem., Med. Res. Counc. Unit Res. Cell Metabol., Univ. Sheffield.]

Paper chromatography of vitamin B₁, its derivatives and other N compounds is described in which the solvent system was *p*-toluene sulphonic

acid, *tert*-pentanol and water, and the spraying agent potassium bismuth iodide. Particulate suspensions of sheep's kidney were prepared as described previously (*Biochem. J.*, 1953, **53**, 305) and the ratio of oxygen uptake to consumption of pyruvate during incubation was estimated after intervals in the presence of vitamin B₁ or its derivatives.

Vitamin B₁, its monophosphate, cocarboxylase, oxythiamine or its diphosphate, did not alter respiration or ratio of oxygen uptake to pyruvate consumption, but the addition of 0.005 *M* vitamin B₁ triphosphate inhibited respiration by 40 per cent. without altering the ratio. Cocarboxylase was converted during incubation into vitamin B₁ monophosphate; apart from the monophosphate and the three P-containing compounds present in the original incubation mixture, phosphopyruvate and an unknown P compound were found. Labelled P in the medium showed that cocarboxylase slowly incorporated small amounts of inorganic orthophosphate, and there was no relationship between the amounts of cocarboxylase broken down and of pyruvate oxidised, showing that cocarboxylase is not a phosphate carrier in this reaction.

The amount of cocarboxylase broken down in the presence of pyruvate or α -oxoglutarate was less than in their absence or than in the presence of succinate. More labelled P was incorporated into the monophosphate formed when the substrate was oxidisable. No monophosphate was formed during incubation of vitamin B₁ with kidney particles in the presence of pyruvate or fumarate, nor was cocarboxylase formed from vitamin B₁ monophosphate, indicating the absence of a phosphorylating enzyme. The absence of enzyme was confirmed in conditions where monophosphate was stable and not converted to free vitamin. Any radio-activity found in monophosphate is ascribed to the agency of "lipothiamide", a reactive form of vitamin B₁, and a scheme of reactions is postulated to explain the results obtained.

V. R. Jackson.

3011

KIESSLING, K. H. **Thiamine triphosphate in bakers' yeast.** *Nature*, 1953, **172**, 1187-1188. [Inst. Zoophysiol., Univ. Upsala.]

A yeast extract rich in vitamin B₁ phosphates was prepared by adding vitamin B₁ to the yeast culture in the presence of glucose (Abst. 3240, Vol. 12). After a crude purification, the phosphates and remaining vitamin B₁ were chromatographed by the method of Kiessling and Lindahl (Abst. 1762, Vol. 24) and the results were compared with those for a mixture of vitamin B₁ and synthetic phosphates. Spraying with alkaline K ferricyanide in alcoholic solution gave spots which fluoresced in ultraviolet light. The mixtures behaved in the same way and gave evidence

of the great ability of baker's yeast to synthesise di- and triphosphates of vitamin B₁.

V. R. Jackson.

3012

MATRACIA, S., BARRESI, M. and PASQUALINO, A. Azione della cocarbossilasi e della tiamina sui glucidi nella fatica sperimentale. [Action of cocarboxylase and of vitamin B₁ on sugars in experimental fatigue.] *Boll. Soc. ital. Biol. sper.*, 1953, **29**, 459-460. [Ist. Patol., Univ. Palermo.]

Groups of 6 guineapigs were given an intramuscular injection of 25 mg. cocarboxylase or 23 mg. vitamin B₁ half an hour before being made to take exercise to the point of exhaustion. They were killed immediately afterwards. For animals given no addition and for those given vitamin B₁ or cocarboxylase the respective mean values were for blood sugar in mg. per cent., before exercise 116, 115, 116, after exercise 64, 68, 62, and for glycogen, in mg. per cent., in the liver 0.13, 0.16, 0.17, and in the muscle 0.68, 0.77, 0.78.

When exercise was only for 5 min. there was a slight rise in blood sugar, and the respective values for liver glycogen were 1.86, 2.06 and 2.20, and for muscle glycogen 1.08, 1.35 and 1.37. For non-fatigued [presumably untreated] animals, the values for liver and muscle glycogen were, respectively, 2.27 and 0.68. Treatment with vitamin B₁ or cocarboxylase thus did not affect the blood values, but after mild exercise did reduce or prevent the fall in liver glycogen and increased the rise in muscle glycogen.—E. M. Hume.

3013

WRIGHT, R. C. and SCOTT, E. M. **Pyruvate and α -ketoglutarate metabolism in thiamine deficiency.** *J. Biol. Chem.*, 1954, **206**, 725-733. [Arctic Health Res. Centre, U.S. Pub. Health Serv., Anchorage, Alaska.]

Rats were given diets containing, per cent., casein 24, fat 20 and sucrose 52, or casein 34 and fat 60.5, with mineral and vitamin supplements, except that vitamin B₁ was given only to some of the animals. The oxygen uptake of homogenates of liver, kidney, heart and brain was measured in a Warburg apparatus with different substrates. In general, vitamin B₁ deficiency reduced oxygen uptake, the decrease being greatest with pyruvate as substrate. There was little decrease in oxygen uptake of deficient tissues with α -ketoglutarate as substrate. When vitamin B₁ pyrophosphate was added to the homogenates from deficient animals, the oxygen uptake rose steeply with pyruvate but there was little effect with α -ketoglutarate. The homogenates from animals on the high-fat diet did not differ in enzymic properties from those from animals on the normal diet, but the animals having a high fat intake were larger and lived

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longer without a supplement of vitamin B₁. The results support the view that, with a high-fat diet, lack of vitamin B₁ is less serious because the normal oxidation of fat, unlike that of carbohydrate, bypasses the oxidation of pyruvate.—A. M. Copping.

3014

HACKEL, D. B., GOODALE, W. T. and KLEINERMAN, J. **Effects of thiamin deficiency on myocardial metabolism in intact dogs.** *Amer. Heart J.*, 1953, **46**, 883–894. [Dept. Pathol., Sch. Med., W. Reserve Univ., Cleveland, Ohio.]

For the method see Title 2798, Vol. 24.

The myocardial metabolism of dogs deprived of vitamin B₁ was compared with that of normal and of starved dogs (Abst. 3286, Vol. 24).

In 7 dogs with acute vitamin B₁ deficiency the mean arterial lactate level was high. The arterio-venous difference was less than that of normal and similar to that of starved dogs. Less than the normal amount of lactate was used per min. by the left ventricle. The arterial pyruvate level also was high, but the mean arterio-venous difference and total pyruvate utilisation were normal. Glucose utilisation was similar to that of starved dogs.

In normal and starved dogs oxygen uptake was independent of the rate of coronary blood flow, but in vitamin B₁ deficiency the extraction was limited at higher rates of flow.—V. R. Jackson.

3015

ORABONA, M. L. Azione comparativa della aneurina e della cocarbossilasi nel beri-beri complicato da squilibri vitaminici. [**Comparative effects of vitamin B₁ and cocarboxylase in beriberi complicated by vitamin imbalance.**] *Internat. Ztschr. Vitaminforsch.*, 1954, **25**, 170–175. [Ist. Clin. Med., Univ. Bari.] French, English and German summaries.

Of 38 pigeons maintained on a diet without vitamin B₁, 14 were given daily 10 mg. folic acid, 15 received daily 15 mg. nicotinic acid, and 9 had no supplement. When signs of vitamin B₁ deficiency were evident, those without supplements were given an injection of 25 mg. vitamin B₁, and all except 1 recovered. In the groups given nicotinic acid or folic acid, some were given 25 mg. vitamin B₁, and all died except one having nicotinic acid; the remainder were given 25 mg. cocarboxylase, and all recovered except 1 which died and 1 which remained paralysed. It is concluded that excess of nicotinic acid or folic acid interfered with the phosphorylation of vitamin B₁.

E. M. Hume.

3016

DESSI, P., LABÒ, G. and GIANNI, A. M. Sulle interazioni dell'aneurina con la vitamina B₁₂. [**Interaction of vitamin B₁ with vitamin B₁₂.**]

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Acta vitaminol., 1953, **7**, 253–256. [Ist. Clin. Med. Gen., Univ. Bologna.] French, English, German and Spanish summaries.

Of 20 male rats weighing about 120 g., given a diet deficient in vitamin B₁, 10 received every 5 days a subcutaneous injection of 500 µg. vitamin B₁₂ per kg. bodyweight; 12 injections in all were given. After 62 days the rats given vitamin B₁₂ were losing weight with signs of polyneuritis, while those without vitamin B₁₂ were still growing. Seven out of 10 recovered when vitamin B₁ was given. The same result was obtained with 2 litters of 9 and 10 rats, divided in half and treated from weaning in the same way as described above, vitamin B₁₂ being given orally at the rate of about 75 µg. per kg. bodyweight daily. Given intraperitoneally vitamin B₁₂ had no such deleterious effect. When weanling rats were used, born of parents maintained for 53 days on a diet deficient in vitamin B₁, those given and not given vitamin B₁₂ grew equally badly, but those not given vitamin B₁₂ survived longer.—E. M. Hume.

3017

RODGER, F. C. **Degenerative changes in the rat visual pathway when thiamin and riboflavin deficiencies are combined.** *Brit. J. Ophthalmol.*, 1954, **38**, 144–155. [Dept. Physiol., Med. Sch., Univ. Durham.]

The description of diet and technique given here should be taken as applicable and supplementary to the account of experiments published earlier (Abst. 2904, Vol. 23). The diet was of casein 15, salt mixture 4, glucose 70, synthetic water-soluble vitamins in solution (500 or 10 µg. per ml.) 10, and synthetic vitamin E in cod liver oil 6 to 10 drops. The "chronic" vitamin B₁ deficiency in the series described here was subacute, but that referred to in Abst. 2904, Vol. 23 was produced by careful variation of the supplementary vitamin B₁ to control anorexia. Riboflavin, 0.3 mg., was given or withdrawn at will.

The series included acute deficiency of vitamin B₁ and riboflavin produced by withdrawal of riboflavin, change from the high to the low vitamin B₁ solution and addition of Pyriethiamin (Merck), duration 19 days; chronic riboflavin deficiency, duration 220 days; chronic vitamin B₁ deficiency with high-carbohydrate diet, duration 85 days; and chronic deficiency of both, duration 200 days. The criteria of deficiency were the usual ones. There were pair-fed controls that remained normal.

In acute deficiency of vitamin B₁ and riboflavin there was anorexia, convulsions and degeneration of parts of the sciatic nerves, but no change in the retina or optic nerve, nor was there any in chronic (220-day) deficiency of riboflavin. In subacute deficiency (85 days) of vitamin B₁ there were

changes in the optic nerve like those already described as due to chronic deficiency (Abst. 2904, Vol. 23), but less severe; in the deficiency of both vitamins the rats lived longer and showed similar more advanced changes. There was no damage to the retina, and it is doubtful whether the riboflavin deficiency was sufficiently prolonged to produce any possible characteristic change.

It is argued from these results that the treatment of amblyopia in prisoners of war should have been with vitamin B₁ and a well balanced diet, not with excess of vitamins.—V. R. Jackson.

3018

KEMÉNY, T., KERTAI, P. and WEISZ, P. Wirkung des Aneurins auf das Hypophysen-Nebennierensystem. [Effect of vitamin B₁ on the anterior pituitary and adrenal system.] *Acta physiol. hung.*, 1954, **5**, 131-137. [Pathophysiol. Inst., Med. Univ., Budapest.] Russian summary.

Adrenocorticotrophic hormone activity in adult rats was assessed by measuring the change in the ascorbic acid content of the adrenal glands after unilateral adrenalectomy and other treatments including section of the spinal cord between the first and second dorsal vertebrae. Ascorbic acid was estimated by a modification of the dinitrophenylhydrazine method. After section of the spinal cord, subcutaneous injection of adrenaline or histamine greatly reduced the ascorbic acid content of the adrenal glands, which was prevented if 2 mg. vitamin B₁ per 100 g. bodyweight were given subcutaneously. Vitamin B₁ injected after removal of one adrenal gland inhibited the fall in ascorbic acid in the other. Eosinopenia induced by adrenaline in intact rats was inhibited by vitamin B₁, but the inhibition did not occur if adrenocorticotrophic hormone was administered. Injection of 1.5 mg. vitamin B₁ per 100 g. bodyweight was only partly effective against the adrenal changes and less was ineffective; the dose of 2 mg. maintained its effect for at least 12 hr. after injection. The results are discussed with reference to assessment of adrenocorticotrophic hormone potency.—A. M. Copping.

3019

GUGGENHEIM, K. Effect of posterior pituitary hormone on water metabolism in thiamine deficiency. *Metabolism*, 1954, **3**, 44-48. [Lab. Nutrit., Hebrew Univ.-Hadassah Med. Sch., Jerusalem.]

In adult male rats, after a water load of 8 per cent. of the bodyweight, the diuretic effect was delayed in vitamin-B₁-deficient animals but not in animals on the same deficient diet supplemented with 0.2 mg. vitamin B₁ per 100 g.; the diet was given to appetite or in amounts equal to those

eaten by the deprived rats. When 50 milli-units of Pitressin in 0.1 ml. saline were given intravenously or intrahepatically 30 min. after the water, excretion of urine was depressed to a greater extent in the deficient rats than in the rats of either non-deprived group. In the non-deprived rats only, the antidiuretic effect of Pitressin was greater when given subcutaneously than when given intrahepatically. The deficient rats excreted more Pitressin in the urine than the non-deprived after the same dose of the hormone. Experiments *in vitro* with extracts of the livers showed that less of the antidiuretic hormone was inactivated by the livers of the deficient rats than of the non-deficient. The addition of vitamin B₁ to the preparations did not restore the capacity to inactivate the hormone. L. Wills.

3020

RINDI, G., FERRARIE, G. and PERRI, V. Correlazione tra piruvato del sangue, aneurina nei tessuti e ipertrofia surrenale nell'avitaminosi B₁ del ratto. [Correlations between blood pyruvic acid, tissue vitamin B₁, and adrenal hypertrophy in vitamin B₁ deficiency in the rat.] *Internat. Ztschr. Vitaminforsch.*, 1954, **25**, 210-224. [Ist. Fisiol., Univ. Pavia.] French, German and English summaries.

Rats weighing from 55 to 60 g. were maintained on a diet complete except for vitamin B₁, and were killed at frequent intervals up to 26 days. The adrenal glands were weighed. Pyruvate was estimated in the blood, and vitamin B₁ by the thiochrome method in the liver, leg muscles and brain. Bodyweight rose slightly and then fell. If the initial mean values are taken as 100, the final mean values were bodyweight 95, weight of adrenal glands 158, blood pyruvate 270, and vitamin B₁ content of liver 5.6, of muscle 21, and of brain 25. Statistical analysis revealed a strong positive correlation between the weight of the adrenal glands and the blood pyruvate value, and a strong negative correlation between the former and the content of vitamin B₁ in the tissues. The increase of pyruvate in the blood was slow at first, and was more closely correlated with the increase in adrenal gland weight than with the decrease of vitamin B₁ in the tissues. There was little correlation between bodyweight and any of the other values.—E. M. Hume.

3021

CACIOPPO, F. Contenuto di cocarbossilasi (APP) nei tessuti di colombe trattati con "orizotossina". [Content of cocarboxylase in the tissues of pigeons treated with oryzatoxin.] *Boll. Soc. ital. Biol. sper.*, 1953, **29**, 479-481. [Ist. Fisiol., Univ. Palermo.]

Of 12 pigeons maintained on a diet of polished rice, 6 received in addition a daily intramuscular

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injection of oryzatoxin. When birds receiving oryzatoxin showed signs of polyneuritis they were killed with corresponding birds in the group without oryzatoxin, and cocarboxylase was estimated by the method of Westenbrink (Absts. 241, Vol. 10; 2936, Vol. 11) in the liver and pectoral muscle. For birds with and without oryzatoxin the respective mean values in $\mu\text{g. per g. tissue}$ were for the liver 5.7 and 8.6, and for the muscle 2.3 and 4.1.

E. M. Hume.

3022

MANNELL, W. A. and ROSSITER, R. J. **Nutritional deficiency and Wallerian degeneration in the rat. 2. Effect of thiamine deficiency on the concentration of nucleic acid and phospholipid in intact and sectioned nerves.** *Brit. J. Nutrition*, 1954, 8, 56-64. [Dept. Biochem., Univ. W. Ontario, London, Canada.]

The methods employed followed those described elsewhere (Abst. 3304, Vol. 24). Rats received for 44 days an adequate basal diet or one deficient in vitamin B₁. In some rats the sciatic nerve was cut and, after 8 days, the concentration of nucleic acid and phospholipin in intact and degenerating nerve was estimated. The values were compared with those for animals of the same age receiving adequate vitamin B₁, called age controls, for younger animals receiving adequate diet but killed when the bodyweight was the same as in deprived rats, called weight controls, and for animals of the same age receiving adequate diet restricted in amount, called weight and age controls.

In the age controls concentrations of nucleic acid and phospholipin in nerve tissue decreased with increasing age and bodyweight, and the previous observation was confirmed that, in the intact sciatic nerve of the rat, the concentration of nucleic acid was characteristic of age but not of bodyweight, and the concentration of phospholipin was characteristic of bodyweight but not of age. In rats deprived of vitamin B₁, the concentration of nucleic acid was less than in the weight controls, but did not differ from that in the age controls; concentrations of phospholipin did not differ from that in the weight controls but were greater than in the age controls.

After section of the sciatic nerve, increase in the concentration of nucleic acids occurred more slowly in rats deprived of vitamin B₁ than in the weight controls, which were younger animals, but at the same rate as in the other 2 sets of controls. The decrease in concentration of phospholipin in nerves from deprived animals took place more slowly than in nerves from any control. The result distinguished the effects of vitamin B₁ deficiency from those of lack of protein or of total calories.

There was no evidence that during degeneration of the sciatic nerve proliferating Schwann cells

provided enzymes which destroyed the myelin sheath, since there was no destruction of myelin or loss of myelin lipids.—V. R. Jackson.

3023

SCHNEUNERT, A. and HAENEL, H. Über die Wirkungen zweier Vitamin-B₁-Analoga nach Dornow und deren Antagonisten im Taubentest. [The effects of two of Dornow's analogues of vitamin B₁ and their antagonists in the pigeon test.] *Hoppe-Seyler's Ztschr.*, 1953, 295, 354-362. [Anst. Vitaminforsch., Potsdam-Rehbrücke.]

Two analogues of vitamin B₁ in which the pyrimidine component was replaced by a pyridine group, and their corresponding antivitamin, in which the thiazole moiety was replaced by a pyridine derivative with corresponding structure, were prepared and tested on pigeons deprived of vitamin B₁. Some vitamin B₁ activity was present in an analogue with 2-amino-6-methylpyridyl-(3)-methyl substituted for the pyrimidine moiety. Introduction of a further methyl group in the 4-position removed the vitamin activity. The antivitamin showed comparable changes in activity and the results were confirmed by microbiological tests.—A. M. Copping.

3024

PUTIGNANO, T. and RAMUNNI, M. Azione favorente dell'idrazide dell'acido isonicotinico e dell'acido p-amino-salicilico sul beri-beri sperimentale. [Action of isonicotinic acid hydrazide and of p-aminosalicylic acid in promoting experimental beriberi.] *Acta vitaminol.*, 1953, 7, 257-259. [Ist. Clin. Med., Univ. Bari.] French, English, German and Spanish summaries.

Of 5 groups of pigeons maintained on a diet of polished rice, 2 groups received 250 mg. p-aminosalicylic acid daily orally or by intramuscular injection, 2 groups received 12 mg. isonicotinic acid hydrazide in the same ways, and the fifth received no addition. Signs of vitamin B₁ deficiency appeared in the 2 groups treated orally more quickly than in the other 3 groups.—E. M. Hume.

3025

FORENBACHER, S. Über die B₁-Avitaminose bei Pferden in Jugoslawien, mit besonderer Berücksichtigung der Rolle des Thiamins in der Pathogenese der Schachtelhalmvergiftung. [Vitamin B₁ deficiency in horses in Yugoslavia, with special reference to the role of vitamin B₁ in the pathogenesis of *Equisetum* poisoning.] *Bull. sci. Yugoslav.*, 1953, 1, 87. [Fac. Med., Univ. Zagreb.]

Typical signs of vitamin B₁ deficiency have been reported recently in horses in Yugoslavia

particularly when fed on acid hay containing from 20 to 50 per cent. of *Equisetum arvense* or *E. palustre*. Similar signs have occurred also where the fodder contained dried bracken. Only 4 per cent. of the cases occurred with meadow hay that contained none of these plants. The latent period before the signs appeared was from 2 to 3 weeks with equisetum hay and from 4 to 6 months with meadow hay. The signs disappeared in 2 or 3 days if vitamin B₁ or dried yeast was given, but the amount needed was greater when equisetum hay had been eaten.—W. Godden.

3026

DEOLALKAR, S. T. and SOHONIE, K. **Thiaminase from fresh-water, brackish-water and salt-water fish.** *Nature*, 1954, **173**, 489-490. [Dept. Biochem., Inst. Sci., Bombay.]

Indian fish of 6 different genera, 2 of each from fresh, brackish and salt water, were ground whole, extracted with water and filtered, and the filtrates were tested for thiaminase activity.

Freshwater fish contained a thiaminase with optimum activity at pH 7. The thiaminases of fish from brackish or salt water had optimum activity at pH 3.6, 5.6 and 7.0. The extracts lost activity after dialysis, but addition of the original extract, boiled, restored activity, which suggested the presence of a coenzyme. Mg and Co salts restored the activity of dialysed extracts of the enzymes with optimum activity at pH 3.6 and 5.6. All the enzymes could be precipitated with ammonium sulphate. They could not be separated by fractional precipitation with acetone, ethanol or dioxane, or by the solvents and adsorbents tried. All were adsorbed on fuller's earth, alumina C_γ and bentonite.—V. R. Jackson.

3027

JACOBSON, K. P. and DEODATA DE AZEVEDO, M. Sur l'activation de la thiaminase. [Activation of thiaminase.] *C.R. Soc. Biol.*, 1953, **147**, 1822-1824. [Inst. Rocha Cabral, Lisbon.]

Vitamin B₁ was incubated with extracts of bracken (*Pteridium aquilinum*) or prawn (*Cyrtomium falcatum*) with or without nicotinamide. After 24 hr. in presence of the 2 extracts and nicotinamide, 50 and 36 per cent. of the vitamin B₁ remained, without nicotinamide 100 and 60 per cent. Corresponding values for the loss after 24 hr. of vitamin B₁ without the enzyme extracts were 55 per cent. with nicotinamide and 44 without; losses after 1 hr. were greater in the absence of nicotinamide.—V. R. Jackson.

3028

ZIZZA, F. Ricerche sulla tiaminasi. 4. Comportamento della piruvemia nei colombi sottoposti a somministrazione di estratti di *Venerupis*

decussata. [Thiaminase. 4. Behaviour of blood pyruvic acid in pigeons given extracts of *Venerupis decussata*.] *Boll. Soc. ital. Biol. sper.*, 1953, **29**, 484-487. [Ist. Fisiol., Univ. Palermo.]

Groups of 6 pigeons fed on maize were given daily by mouth an aqueous extract of the mollusc *Venerupis*, prepared by the method of Cacioppo *et al.* (Absts. 1728, Vol. 21; 1912, Vol. 22), or the same extract heated for 10 min. at 100° C., or the unheated extract with a daily intramuscular injection of 2 mg. vitamin B₁. The birds given the unheated extract died in from 4 to 12 days with great neuromuscular disturbance; those given the heated extract died in from 8 to 14 days with less neuromuscular disturbance. The birds given unheated extract with vitamin B₁ died in from 16 to 32 days with the same signs as those given the heated extract. Pyruvic acid in the blood rose to 3.76 from 1.48 mg. per 100 ml. in the first group, but was not affected in the other two. It is concluded that *Venerupis* contains a heat-stable toxin as well as thiaminase.—E. M. Hume.

3029

KIMURA, R. and LIAO, T. H. **A new thiamine decomposing anaerobic bacterium, *Clostridium thiaminolyticum* Kimura et Liao.** *Proc. Japan Acad.*, 1953, **29**, 132-133. [Microbiol. Inst., Fac. Med., Univ. Kyoto.]

Another micro-organism that decomposes vitamin B₁ is added to the 2 already reported (Kuno, *Proc. Japan Acad.*, 1951, **27**, 362; 1952, **28**, 235). Nine strains of it were isolated from the faeces of 505 patients and healthy subjects from in and around Kyoto City. The organism is described and its cultural characteristics are listed. It is named *Clostridium thiaminolyticum*, Kimura et Liao.—E. M. Hume.

3030

WAIBEL, P. E., CRAVENS, W. W., BIRD, H. R. and BAUMANN, C. A. **Rhythmic responses of chicks to injected thiamine.** *J. Nutrition*, 1954, **52**, 65-73. [Dept. Poultry Husb., Coll. Agric., Univ. Wisconsin, Madison.]

Chicks were maintained in batteries and from 7 days of age were given a diet lacking in vitamin B₁. On the 9th and 10th day each chick received by injection 9 µg. of vitamin B₁, an amount calculated to support half maximum growth. On the 11th day the chicks were separated into uniform groups of 10. Two groups received 1 or 6 µg. vitamin B₁ per g. diet; 6 groups were given subcutaneous injections for 16 days, the total amount of vitamin B₁ injected being the same in all groups. Intervals between injections varied from 12 to 96 hr. Chicks given adequate or suboptimum amounts of the vitamin in the diet showed a growth rhythm

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in which weight increase took place mainly during the day, though food was always available and illumination continuous. The rhythm was intensified in birds injected at 8 a.m. with suboptimum amounts of vitamin B₁. In birds injected at 8 p.m. the rhythm was reversed. The relatively larger increases which occurred after a morning injection were attributed to a sudden increase in the intake of food and water superimposed on the normal, fundamental rhythm. The more frequent the injection, the more efficiently was the vitamin utilised. The amount of vitamin B₁ required to be injected per g. weight increase was, in $\mu\text{g.}$, twice daily 1.78 to 1.82, once daily 2.22, every other day 3.53, every 4th day 4.82. For chicks given adequate dietary vitamin B₁ the amount was 2.15 $\mu\text{g.}$ daily.—E. M. Cruickshank.

3031

BUTSCHEK, G., KRAUSE, G. and ROSKOPP, W. Der Vitamin B₁-Gehalt von Hefen, seine Beeinflussung und seine Bestimmung mit der Fermentmethode. [Vitamin B₁ content of

yeasts, its control and its estimation by the enzyme method.] *Ztschr. Lebensmittel-Untersuch. Forsch.*, 1954, **98**, 89-105. [Zellstoff Fabrik Waldhof, Werk Kostheim.]

Values reported in the literature for the vitamin B₁ content of yeasts are tabulated, and the wide variations are discussed with reference to methods of culture and of estimating vitamin B₁. In the present study the vitamin was estimated in a number of commercial yeast preparations by the fermentation method of Schultz *et al.* (Absts. 4727, Vol. 7; 198, Vol. 12). The values in mg. per cent. found for dried brewer's yeasts ranged from 15.6 to 27.8 and for pressed baker's yeasts from 2.3 to 2.8. Yeasts grown under special conditions for food or for medicinal purposes showed some very high values for vitamin B₁, up to 95.5 for a dried, vitamin-rich baker's yeast. Tests were made on fresh dried yeasts and on samples stored for from 4 to 11 months, and no evidence was obtained that vitamin B₁ potency was lost during storage.

A. M. Copping.

See also Abst. 3285.

RIBOFLAVIN

3032

SATO, T., YOSHIMURA, J. and TAKAOKA, T. A new synthesis of riboflavin-5'-phosphate. *Proc. Japan Acad.*, 1953, **29**, 260-261. [Org. Chem. Div., Inst. Technol., Tokyo.]

Synthesis was with alkyl dichlorophosphate in place of phosphorus oxychloride or metaphosphoric acid, which are generally used.—E. M. Hume.

3033

ADAMS, D. H. Liver catalase activity in the riboflavin deficient mouse. *Biochem. J.*, 1954, **56**, xxvi. [Cancer Res. Dept., London Hosp. Med. Coll., London, E. 1.]

3034

BLAIR, J. A. and GRAHAM, J. The pigments of snake skins. 1. The isolation of riboflavin as a

pigment of the skins of the green snakes *Philothamnus semivariegatus* and *Dispholidus typus*. *Biochem. J.*, 1954, **56**, 286-287. [Univ. Coll. Gold Coast.]

Skins from *Philothamnus semivariegatus*, treated in the dark with absolute ethanol, gave extracts which suggested the presence of riboflavin. Extracts from the skin of the same snake and of *Dispholidus typus* were prepared in the dark with a mixture of water, pyridine and *n*-propanol. Both extracts were yellow with green fluorescence. Paper chromatograms of the extracts and ultraviolet absorption spectra of the spots, compared with those of riboflavin, showed that both snake skins contained it.—V. R. Jackson.

See also Absts. 2995, 3017, 3063.

NICOTINIC ACID (NIACIN)

3035

HOLMAN, W. I. M. A colorimetric method for the determination of the principal metabolites of nicotinic acid in human urine. *Biochem. J.*, 1954, **56**, 513-520. [Med. Res. Coun. Dept. Exp. Med., Univ. Cambridge.]

From the evidence of several groups of workers it appears that the main metabolites of nicotinic acid excreted in human urine are N-methyl-2-pyridone-5-carbonamide and N-methylnicotin-

amide. For the purpose of assessing the nicotinic acid status of man a method of estimating the two substances was developed in which the carbonamide group was converted to an amino-group by heating with hypobromite, diazotised and coupled to yield an azo dye.

If the proportion of hypobromite was large relative to the amount of pyridone present no colour developed, but when the amount of hypobromite was controlled by removing excess with

phenol before heating, azo colour was developed with N-methyl-2-pyridone-5-carbonamide, N-methyl-2-pyridone-3-carbonamide, N-methylnicotinamide and nicotinamide; N-(1-naphthyl-) ethylenediamine dihydrochloride was the coupling agent. The 4 substances gave purple, blue, orange and orange dyes, respectively. The best results were obtained when the dyes were protected from light; slightly more alkaline hypobromite was needed for nicotinamide and its N-methyl derivative. Details are given of methods for estimating from 1 to 50 $\mu\text{g.}$ of the compounds; colours were estimated photo-electrically.

Interfering substances had to be removed from urine; Lloyd's reagent was used for N-methyl-2-pyridone-5-carbonamide and Decalso for N-methylnicotinamide. Details of the methods are given.

Urinary excretion of the two main metabolites was estimated for 3 subjects before and after 600 mg. quinolinic acid, given orally or intravenously. The results showed that only a small amount of the quinolinic acid was converted to nicotinic acid before excretion.—V. R. Jackson.

3036

ALCANTARA E., G. Obtención del ácido nicotínico y nicotinamida a partir de la nicotina del tabaco peruano. [Preparation of nicotinic acid and nicotinamide from the nicotine of Peruvian tobacco.] *An. Fac. Farm. Bioquím., Lima*, 1952, **3**, 449–457. [Lab. Quím. Orgán., Univ. Lima.]

Methods are described for transforming nicotine extracted from tobacco leaves into nicotinic acid and nicotinamide.—A. M. Copping.

3037

STOKELY, P. S. The synthesis of nicotinic acid by *Chilomonas paramecium*. *Exp. Cell. Res.*, 1953, **5**, 320–324. [Biol. Dept., Univ. Notre Dame, Ind.]

The synthesis of nicotinic acid by bacterium-free cells of *Chilomonas* was measured microbiologically with *Lactobacillus arabinosus*. Extraction with takadiastase alone or with papain, with hot HCl or hot water gave closely comparable results but digestion with papain alone gave very low results. The average amount of nicotinic acid obtained was 0.129 $\mu\text{g.}$ per mg. dry weight; it was present in the cells and not in the culture fluid, and manometric measurements of cozymase activity suggested that it was present in the form of diphosphopyridine nucleotide.—A. M. Copping.

3038

VILLA, L. and DIOGUARDI, N. Action of niacinamide on the O_2 consumption by homogenates of rat liver. *Experientia*, 1953, **9**, 469. [Inst. Clin. Gen. Med., Univ. Milan.] French summary.

Homogenates were prepared from livers of rats that had received a mixed natural diet. Nicotinamide was added to the homogenates in a first series after they had stood for 10 min. at 30° C. or in a second series when freshly prepared at 0° C. Oxygen uptake was estimated manometrically. In the first series oxygen uptake was irregular and was not affected by the presence of nicotinamide within the first 240 min. after its addition. In the second series presence of nicotinamide caused a great increase in oxygen consumption. The respiratory rate was not affected by addition of 2:4-dinitrophenol and aureomycin, but respiration was inhibited by α -tocopherol and destroyed by KCN. Respiratory activity of homogenates in presence of nicotinamide was destroyed in 40 min. at 50° C.—V. R. Jackson.

3039

EL RIDI, M. S., ABDEL KADER, M. M., HABIB, A. and ABDEL AZIZ, A. Role of tubercle bacilli in raising the nicotinic acid level in the blood. *J. Egypt. Med. Assoc.*, 1953, **36**, 435–444. [Biochem. Dept., Kasr El Aini Fac. Med., Univ. Cairo.]

Of 30 guineapigs maintained on a diet of clover, 15 were given an intramuscular injection of 2 mg. of a culture of *Mycobacterium tuberculosis*, human type. Animals in both groups were killed after 3, 4 and 6 weeks. For the non-infected and infected animals, respectively, the mean values were for haematocrit 41.6 and 35.3, for blood nicotinic acid 393 and 1405 $\mu\text{g.}$ per 100 ml., and for total pyridine nucleotides in the blood 44.4 and 78.7 $\mu\text{g.}$ per ml.—E. M. Hume.

3040

CHERKES, G. A. Metilirovanie nikotinovoi kisloty v usloviyakh gipotireoza. [Methylation of nicotinic acid in hypothyroid states.] *Vop. Pitan.*, 1954, **13**, 12–15. [Lab. Exp. Patol., Inst. Pitan., Akad. Med. Nauk. SSSR, Moscow.]

The urinary excretion of N¹-methylnicotinamide in response to nicotinamide (20 mg.) was estimated in 7 rats before and after administration of sufficient thiouracil to cause hypothyroidism (20 mg. daily for 20 days). The amount excreted after the second test dose was in every case smaller than that after the first. It is deduced that thyroid hormone exerts an influence on that phase of nicotinic acid metabolism which involves methylation.—D. W. Taylor.

3041

QUAGLIARIELLO, G. and PORCELLATI, G. Sulla presenza in un estratto di rene di un enzima amidante l'acido nicotinico. [Presence in a kidney extract of an enzyme transforming

nicotinic acid to amide.] Su di alcune proprietà della nicotinamidasi del rene di maiale. **[Some properties of the nicotinamidase from pig's kidney.]** *Boll. Soc. ital. Biol. sper.*, 1953, **29**, 475-477; 477-479. [Ist. Chim. Biol., Univ. Naples.]

A powdered preparation from an acetone extract of pig's kidney was ineffective in forming nicotinamide from phosphate and ammonium nicotinate. When, however, the Na salt of adenosinetriphosphate was added, considerable amounts of nicotinamide were formed. When the system contained as well Na succinate, succinic dehydrogenase and cytochrome *c*, the amount of nicotinamide was still further increased, although without adenosinetriphosphate the succinic oxidase system alone was ineffective.

In the foregoing experiment synthesis was almost complete in 3 hr. The optimum pH was from 7.0 to 7.2. There did not appear to be any consumption of oxygen during the synthesis. The enzyme was inactivated by dialysis against water, but activity was restored by mixing the two fractions or adding Mg^{++} to the internal one.

E. M. Hume.

3042

CEDRANGOLO, F., DELLA PIETRA, G. and QUAGLIARIELLO, E. Interrelazione triptofano-acido nicotinicco.1.] **[Interrelations of tryptophan and nicotinic acid. 1.]**

CEDRANGOLO, F., QUAGLIARIELLO, E. and DELLA PIETRA, G. 2. *Bull. Soc. ital. Biol. sper.*, 1953, **29**, 481-483; 483-484. [Ist. Chim., Fac. Med., Univ. Naples.]

1. Eggs of Leghorn fowls were inoculated on the 7th day of incubation with from 278 to 887 μg . of neutralised quinolinic acid solution or with saline. On the 18th day, nicotinic acid in the egg was estimated microbiologically with *Lactobacillus arabinosus* 17/5. There was no difference in the content of nicotinic acid between the two sets of eggs, and the quinolinic acid injected remained unchanged.

2. Hydroxyanthranilic acid was injected in the same way, and the result was equally negative.

E. M. Hume.

3043

DELLA PIETRA, G. and QUAGLIARIELLO, E. Sul dosaggio microbiologico dell'acido chinolinico nell'uovo di pollo. **[Microbiological estimation of quinolinic acid in the hen's egg.]**

QUAGLIARIELLO, E. and DELLA PIETRA, G. Variazioni del tasso di acido chinolinico nell'uovo di pollo nel corso dello sviluppo embrionale. **[Changes in the concentration of quinolinic acid in the hen's egg during development of the embryo.]** *Boll. Soc. ital. Biol. sper.*, 1953, **29** 516-518; 518-520. [Ist. Chim., Fac. Med., Univ. Naples.]

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The results recorded in the preceeding Abst. are put forward again and discussed.

In hen's eggs nicotinic acid was estimated with *Lactobacillus arabinosus* 17/5 before and after decarboxylation of quinolinic acid by acid autoclaving, the increase in amount of nicotinic acid being taken to represent quinolinic acid. The most satisfactory conditions for autoclaving were at 121° C. for 2 hr. with 2 ml. glacial acetic acid per g. homogenised egg. The mean of the values obtained by the different slight variations of the autoclaving technique was, in μg . quinolinic acid per g. egg, before incubation 0.25 and after 18 days' incubation 2.73.—E. M. Hume.

3044

BUTENANDT, A., SCHULZ, G. and HANSER, G. Über 5-Oxy-kynurenin, seine Synthese und physiologische Bedeutung. **[5-Hydroxykynurenine, its synthesis and physiological significance.]** *Hoppe-Seyler's Ztschr.*, 1953, **295**, 404-410. [Max-Planck Inst. Biochem., Univ. Tübingen.]

Synthesis is described of *dl*-5-hydroxykynurenine on Sørensen's principle for amino-acid preparation (*Hoppe-Seyler's Ztschr.*, 1905, **44**, 448). The synthetic material was inactive in eye-pigment tests with *Drosophila* and *Ephesia*, and could not replace nicotinamide for growth of *Neurospora crassa*. Kynureninase split the substance into alanine and 5-hydroxyanthranilic acid. The results suggested that 5-hydroxykynurenine is not a normal intermediary in tryptophan metabolism or in synthesis of the pigment in the eye of *Drosophila* or *Ephesia*.—A. M. Copping.

3045

DONDERO CORTES, V. Valoración de acido nicotínico en tejidos animales. **[Estimation of nicotinic acid in animal tissues.]** *An. Fac. Farm. Bioquim., Lima*, 1952, **3**, 71-77. [Lab. Invest., Univ. Lima.]

Nicotinic acid was extracted after acid hydrolysis from animal tissues and estimated in the extracts by the CNBr method. In cuts of mutton and beef, values ranged from 3 to 8 mg. per cent., the highest values being found in shoulder of mutton. Chicken meat was poorer, containing on the average 1.5 mg. nicotinic acid per cent. Whale-meat averaged 3.7 mg. The values are of the same order as, though a little below, those reported by investigators in other countries.—A. M. Copping.

3046

HINTON, J. J. and SHAW, B. The distribution of nicotinic acid in the rice grain. *Brit. J. Nutrition*, 1954, **8**, 65-71. [Res. Assoc. British Flour Millers, Cereals Res. Stat., St. Albans.]

Two samples of rice, one a short, broad, white

grain of Egyptian origin and one a long, narrow, red-skinned Indian variety, were dissected by hand into their structural parts and nicotinic acid was estimated in them microbiologically (Heathcote *et al.*, Abst. 449, Vol. 22). Removal of lipid had no effect on the results, so was omitted. Results are given in terms of air-dry weight, with 89 per cent. dry matter.

For the Egyptian and Indian varieties, respectively, the percentage of the grain represented by the pericarp and aleurone layer was 5 and 7, outer endosperm 6.1 and 5.9, inner endosperm 85.6 and 84.8, embryo and scutellum 3.3 and 2.3. The division into outer and inner endosperm was somewhat arbitrary. The total content of nicotinic acid in the dissected grains was 4767 and 7081 mg. per 100 g. The percentage of the total vitamin in different parts of the two varieties was 78.5 and 85.5 for pericarp and aleurone, 11.1

and 7.8 for outer endosperm, 6.7 and 4.5 for inner endosperm, and 3.7 and 2.2 for embryo and scutellum. The differences between the red- and white-skinned varieties were not significant.

Comparison with wheat of comparable total nicotinic acid content showed that the gradient of content in the endosperm, declining from the periphery to the centre, was steeper than in wheat, and that the concentration in rice endosperm was about two-thirds of that in wheat.

The concentration in the pericarp was 6 times that in wheat. The distribution of nicotinic acid differed from that of vitamin B₁, of which 50 per cent. was in the scutellum; in modern milling practice the production of milled rice with a satisfactory nicotinic acid content would present a difficult problem, owing to the presence in the pericarp of so high a proportion of the total nicotinic acid in the grain.—V. R. Jackson.

VITAMIN B₆ (PYRIDOXINE, ADERMIN)

3047

FUKUI, S. **Differential determination of vitamin B₆ group.** *Anal. Chem.*, 1953, **25**, 1884-1886. [Dept. Indust. Chem., Fac. Eng., Univ. Kyoto.]

From extracts containing pyridoxine, pyridoxal and pyridoxamine, a cation exchange synthetic resin removed pyridoxamine, and pyridoxal was destroyed by treatment with acetone and NaOH. At each stage the vitamin B₆ activity was estimated with *Saccharomyces carlsbergensis*. Measurement by this method of the vitamin B₆ components in rice bran, yeast, liver and heart gave results similar to those reported by Rabinowitz and Snell, who used specific micro-organisms to estimate the different components (*cf.* Abst. 4335, Vol. 18).

A. M. Copping.

3048

CONDAL BOSCH, L. and COSÍN GARCÍA, R. Estudios sobre carboxilasas. 2. Determinación cuantitativa de codescarboxilasa (piridoxal-fosfato). [Studies of carboxylases. 2. Quantitative estimation of codecarboxylase (pyridoxal phosphate).] *Rev. española Fisiol.*, 1953, **9**, 189-203. [Inst. Español Fisiol., Madrid.] English summary.

A manometric technique was devised for measuring the rate of reaction between the source of codecarboxylase to be tested and an apodecarboxylase derived from an acetone extract of *Streptococcus faecalis* R. No standard was employed but decarboxylase activity was estimated by calculation and expressed in terms of the activity of pyridoxal phosphate. An approximate formula was derived and a correction applied through a curve of rectification. [It is not possible

to abstract the mathematical material, for which the original paper should be consulted.]

A. M. Copping.

3049

TAPPAN, D. V. and ELVEHJEM, C. A. **Observations on the nutrition of rhesus monkeys receiving highly processed rations.** *J. Nutrition*, 1953, **51**, 469-477. [Dept. Biochem., Univ. Wisconsin, Madison.]

The 5-in-1 army combat ration of processed foods was tested on 6 rhesus monkeys. If no supplement was given the monkeys lost interest in their food and showed signs of malnutrition after about 4 months. Addition of ascorbic acid produced temporary improvement, but further addition of pyridoxine and folic acid was necessary to maintain health and weight. Injections of penicillin and aureomycin to control secondary infections in some animals seemed to have a beneficial effect on their nutritional state. The animals were maintained on the ration with vitamin supplements for from 16 to 26 months. The observations are discussed with reference to previous tests of the rations on rats and to man's need for vitamin supplements.—A. M. Copping.

3050

TAPPAN, D. V., LEWIS, U. J., METHFESSEL, A. H. and ELVEHJEM, C. A. **Studies concerning the pyridoxine requirements of rats receiving highly processed rations.** *J. Nutrition*, 1953, **51**, 479-490. [Dept. Biochem., Univ. Wisconsin, Madison.]

Previous studies (Absts. 2241, 2242, Vol. 18) showed that the K type of emergency army ration

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was unsatisfactory for the growth of young rats. It was modified and tested with and without additions, with growth of rats during 4 weeks from weaning as criterion. A supplement of vitamin B₆ was found necessary, which could be provided by replacing pork and egg in the ration by beef. The need for extra vitamin B₆ appeared to arise through the processing of the pork and egg constituents. Substitution of Spam, or chicken, pork and beef loaf, or casein, for the pork and egg also gave improved growth. Further addition of vitamin B₆ always increased the growth response.

Tests with the more elaborate 5-in-1 ration showed that it supported good growth in young rats and that vitamin B supplements produced only slight improvement.—A. M. Copping.

3051

KIRCHER, W. Untersuchungen über die Wirksamkeit des Vitamins B₆ (Pyridoxin) bei diphtherischen Lähmungen. [**Effect of vitamin B₆ (pyridoxine) on paralysis due to diphtheria.**] *Internat. Ztschr. Vitaminforsch.*, 1954, **25**, 175-185. [Kinderklin., Univ. Graz.] English and French summaries.

An injection of diphtheria toxoid of known potency was given to 51 guineapigs; 26 of them received no treatment, and 25 were given daily 2 or 5 µg. vitamin B₆ subcutaneously from 2 days after the injection of the toxoid. Moderately severe localised paralysis was produced in all the untreated animals but in only 17 of the treated; the duration and degree of paralysis was less in the treated, and the onset was delayed. In a further experiment a dose of toxoid lethal to untreated animals was used, and vitamin B₆ had some protective value. A clinical trial in 37 patients with severe diphtheria and paralysis suggested that pyridoxine influenced the paralysis favourably.—L. Wills.

3052

GRADOS RODRIGUEZ, R. Acción de la piridoxina sobre la glucemia. [**Effect of pyridoxine on blood sugar.**] *An. Fac. Farm. Bioquim., Lima*, 1952, **3**, 378-388. [Lab. Farmacol. Exp., Univ. Lima.]

Administration of 0.2, 0.4, 0.6 or 0.8 mg. pyridoxine by mouth or of 0.5, 100, 150 or 200 mg. by intraperitoneal injection raised the blood sugar in rabbits. The peak was attained 2 to 4 hr. after the pyridoxine was given and was higher in male than in female animals. The percentage increase in blood sugar was roughly proportional to the size of the dose given.—A. M. Copping.

3053

BEATON, J. R., BEARE, J. L., BEATON, G. H., WHITE, J. M. and MCHENRY, E. W. **The**

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basal metabolic rate and the effects of thiouracil administration and of thyroidectomy on control and vitamin B₆-deficient rats. *J. Nutrition*, 1943, **51**, 599-608. [Dept. Pub. Health Nutrit., Univ. Toronto.]

Groups of comparable rats weighing about 100 g. were given a purified diet containing 20 per cent. fat and 20 per cent. casein. All the rats received 100 µg. deoxypyridoxine daily and two groups received pyridoxine, one fed to appetite and the other with its food intake limited to that of the deficient rats. The average basal metabolic rate was found to be affected by inanition but not further by lack of vitamin B₆. When thiouracil was given to rats deprived of vitamin B₆ it appeared to increase the severity of the skin lesions, but did not cause definite changes in body composition or blood metabolites which could be attributed to exacerbation of the deficiency. Inconclusive results were obtained also in thyroidectomised rats.—A. M. Copping.

3054

CALDWELL, E. F. and MCHENRY, E. W. **Effect of the basal diet on urea formation in vitamin B₆ deficiency.** *Arch. Biochem. Biophys.*, 1954, **48**, 50-54. [Dept. Pub. Health Nutrit., Univ. Toronto.]

Young adult rats received a diet with, per cent., casein 20, maize oil 20 and sucrose 54 with salts and vitamins, but lacking vitamin B₆, for 30 days and then were given an initial dose of 2 mg. urea N per g. bodyweight in normal saline followed by 1 mg. per g. after 3, 6, 9, 12 and 15 hr., or corresponding injections of saline. After 17 hr. urea formation by liver slices *in vitro* was estimated. Those with injections of saline formed only just significantly more urea than those with abnormally high blood concentrations of urea.

In another series rats received a diet with 94 per cent. casein. One group had no supplement; the other had the food intake restricted to that of the first group but was given a supplement of 50 µg. vitamin B₆ daily. After 21 days the rats fasted for 21 hr. and urea formation by the liver was estimated. Liver slices from rats deprived of vitamin B₆ formed more urea than slices from rats having the vitamin but restricted food intake, but the difference just failed to be significant. In both groups, the values were lower than when only 20 per cent. casein was given. To determine whether this partial inhibition was due to the high casein content of the diet, 2 groups of rats received a diet containing 74 per cent. casein with either sucrose or maize oil 20, salts 4, agar 2, and all vitamins. After 7 weeks the rats were fasted for 45 hr. and urea formation by the liver was estimated. There were differences between the 2

groups, those with 20 per cent. fat having the higher urea formation and the lower blood urea values, which were the same as were obtained previously with 20 per cent. casein and fat. (Abst. 439, Vol. 24.)—V. R. Jackson.

3055

CENNAMO, C. **Non-enzymatic transamination between peptides and pyridoxal.** *Naturwissenschaften*, 1954, **41**, 39. [Inst. Human Physiol., Univ. Modena.]

The method of Metzler and Snell (Abst. 1968, Vol. 22) was employed with alum as catalyst. Transamination occurred between some peptides and pyridoxal.—W. Godden.

3056

HURWITZ, J. **The enzymatic phosphorylation of pyridoxal.** *J. Biol. Chem.*, 1953, **205**, 935-947. [Dept. Biochem., Sch. Med., W. Reserve Univ., Cleveland, Ohio.]

A kinase was obtained from brewer's yeast and purified by a series of reactions described in detail. The purity of the kinase could be measured by its ability to catalyse the reaction pyridoxal \times adenosinetriphosphate \rightarrow pyridoxal pyrophosphate + adenosinediphosphate. The optimum temperature for the reaction was 47°C. and the pH from 6.6 to 7.0. The presence of a divalent metal such as Zn, Co⁺⁺, Mg⁺⁺, Ni⁺⁺ or Fe⁺⁺ appeared to be essential to the reaction. The kinase was specific for adenosinetriphosphate and other phosphates could not replace it as phosphorylating agent. Adenine, adenosine, adenylic acid, adenosinediphosphate, inositol triphosphate, and pyrophosphate inhibited the phosphorylation. The nature of the inhibition was studied but was not completely elucidated. The kinase was specific for the phosphorylation of pyridoxal, and the formation of pyridoxal phosphate from other pyridoxine derivatives was not explained by these experiments.—A. M. Copping.

3057

CHATAGNER, F., TABECHIAN, H. and BERGERET, B. **Répercussion d'une carence en vitamine B₆ sur le métabolisme de l'acide L-cystéine-sulfinique, *in vitro* et *in vivo*, chez le rat. [Repercussions of a deficiency of vitamin B₆ on the metabolism of L-cysteine sulphinic acid, *in vitro* and *in vivo*, in the rat.]** *Biochim. biophys. Acta*, 1954, **13**, 313-318. [Lab. Chim. Biol., Fac. Sci., Paris.] English and German summaries.

Two groups of young rats received an adequate synthetic basal diet, except that one group was deprived of vitamin B₆. Urine was collected for 24 hr., and amino-acids were estimated chromato-

graphically. Homogenates were made from liver and their enzymic activity in desulphinating transamination and in decarboxylation of cysteine sulphinate was estimated.

After 2 months, the non-deprived rats had gained up to 40 g., and the deprived rats had fallen back to their initial weight and were showing signs of deficiency. Chromatography of the urine showed that large quantities of taurine and a considerable amount of hypotaurine were excreted by the non-deprived rats but not by the deprived, whose urine contained a substance which behaved like cystathionine. The addition of 1 per cent. cysteine sulphinic acid to the rats' diet did not affect the findings, although there was a decrease of total urinary N for which no explanation could be given.

There was little difference between the desulphinating transamination activity of liver from deprived and non-deprived rats, and addition of pyridoxal phosphate to the homogenates had no effect.

The livers of non-deprived rats produced 0.9 mg. hypotaurine per g. fresh liver in 4 hr.; livers from deprived rats, did not form hypotaurine. Addition of pyridoxal phosphate with or without Mg, adenosinetriphosphate or cysteine did not affect the results. It is concluded that the absence of taurine from the urine of the deprived rats was caused by suppression of the decarboxylation of cysteine sulphinic acid.—V. R. Jackson.

3058

BUTLER, L. C. and MORGAN, A. F. **Blood eosinophil levels in the young and adult pyridoxine-deficient rat.** *Proc. Soc. Exp. Biol. Med.*, 1954, **85**, 139-142. [Dept. Home Econ., Univ. California, Berkeley.]

Eight weanling male rats which had been with lactating mothers receiving no vitamin B₆ since 15 days old received a vitamin-B₆-free diet of high protein content. Two comparable groups from normal mothers acted as normal and inanition controls and received complete diet to appetite or with the intake restricted so that weights were similar to those of deprived rats. Three groups of 8 adult male stock rats received similar diets, with the addition of deoxypyridoxine to the diet of the deprived group. Eosinophil counts were made in the young rats at weekly intervals for 9 weeks and in the adult rats at irregular intervals after 25 to 46 days.

In the young animals weight rose to 68 per cent. above initial weight in deprived and inanition controls and to 450 per cent. in normal controls. Xanthurenic acid was found in urine after 2 weeks and acrodynia appeared in the third week. The normal controls showed a continuous and sharp increase in number of circulating eosinophils from 27 to 268 per c.mm. in the eighth week, when no

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further rise occurred. In deprived and inanition controls there were gradual and similar increases which did not reach normal levels.

Deprived adult animals and their inanition controls lost 29 per cent. of their weight while normal rats gained 3.5 per cent. Eosinophil levels showed no significant variation in normal rats; in the two other groups there was a gradual fall to a significantly lower level at 33 days, and the level remained low until the end of the test. It is concluded that inanition alone was responsible for the chronic endogenous eosinopenia.—V. R. Jackson.

3059

DIETRICH, L. S. and SHAPIRO, D. M. **Antagonist studies: comparison of desoxypyridoxine and pyridoxine-deficiency therapy on various vitamin B₆ enzymes.** *Proc. Soc. Exp. Biol. Med.*, 1953, **84**, 555-558. [Dept. Biochem., Coll. Phys. Surg., Columbia Univ., New York.]

Two groups of 20 male black mice received a stock diet and 150 mg. deoxypyridoxine per kg. bodyweight, or saline, intraperitoneally daily for 14 days. Two other groups received a synthetic basal diet of high protein content, one complete and the other without vitamin B₆. The animals were killed. Glutamic-aspartic transaminase, dihydroxyphenylalanine (dopa) decarboxylase and cysteine desulphydrase were estimated in the liver.

In mice deprived of vitamin B₆, the activity of all 3 enzymes was significantly reduced, that of cysteine desulphydrase most. Deoxypyridoxine reduced the activity of transaminase greatly and of dopa decarboxylase significantly but less severely; the activity of cysteine desulphydrase was unimpaired.—V. R. Jackson.

3060

BOONE, I. U. and WOODWARD, K. T. **Relationship of pyridoxine and its derivatives to the mechanism of action of isoniazid.** *Proc. Soc. Exp. Biol. Med.*, 1953, **84**, 292-296. [Los Alamos Sci. Lab. (Univ. California), Los Alamos, N. Mex.]

The power of B vitamins to reverse inhibition of growth by isoniazid was investigated with *Lactobacillus plantarum*, *Streptococcus pyogenes*, *Bacterium coli*, *Saccharomyces carlsbergensis*, *Mycobacterium tuberculosis* and *Mycobacterium butyricum*. With *L. plantarum* and *S. carlsbergensis* inhibition by isoniazid was completely reversed by pyridoxine and its derivatives. Pyridoxal and pyridoxamine were from 1000 to 4000 times more effective than pyridoxine itself. With *Bact. coli*, inhibition was only partly reversed by pyridoxine and its derivatives, and with the mycobacteria tested there was no reversal of inhibition. Nicotinic acid, vitamin B₁, pantothenate, p-amino-

benzoic acid and riboflavin had no effect on isoniazid inhibition of *L. plantarum*.

A. M. Copping.

3061

KOTAKE, Y., KOTAKE, Y. (JR.), HISHIKAWA, M., SAKAN, T. and YAMAGUCHI, M. **Studies on xanthurenic acid. 4. Effect of insulin on tryptophan metabolism.** *J. Biochem., Tokyo*, 1953, **40**, 383-386. [Biochem. Dept., Med. Coll., Wakayama.]

In continuation of previous work (Absts. 1973, Vol. 22; 5013, Vol. 23), rats weighing 150 g. were given a single dose of 0.1 g. tryptophan and 0.4 g. Na butyrate, and some were injected with insulin. The urine passed in the ensuing 24 hr. was treated with mercuric acetate, and the precipitate was decomposed with H₂S; the solution was concentrated and subjected to chromatographic analysis on paper. The chromatogram was developed with butanol, acetic acid and water, and the appropriate reagents were applied. In the urine of the rats given insulin, the spot representing xanthurenic acid was much weaker, and the spot representing anthranilic acid was much stronger, than in the urine of the rats not given insulin. The effect had little relation to the size of the dose of insulin. It is concluded that insulin promoted more normal metabolism in rats given Na butyrate with tryptophan.—E. M. Hume.

3062

TENCONI, L. T. **Analisi cromatografica di urine di ratti carenti in axeroftolo o in piridoxina, dopo carico di triptofano. [Chromatographic analysis of the urine of rats deprived of vitamin A or vitamin B₆, after a dose of tryptophan.]** *Boll. Soc. ital. Biol. sper.*, 1953, **29**, 504-505. [Reperto Biol., Lab. Ricerche, Lepetit S.p.A., Milan.]

Rats were maintained on a diet deficient in vitamin A with or without a daily supplement of 125 µg. vitamin A, or on a diet deficient in vitamin B₆ with or without a daily supplement of 100 µg. pyridoxine. After 5 weeks, by which time the rats deprived of vitamin A were beginning to show signs of deficiency, all the rats were given a single oral dose of 500 mg. l-tryptophan per kg. bodyweight. The test was repeated after 10 weeks, when signs of deficiency in both deprived groups were severe. Urine was collected for the 24 hr. after the test and was analysed chromatographically on paper. The changes in the chromatogram caused by administration of tryptophan were not affected by deprivation of vitamin A, but deprivation of vitamin B₆ caused disappearance of anthranilic acid and its conjugates, appearance of 3-hydroxykynurenine and kynurenine, increase of xanthurenic acid and decrease of kynurenine acid. (See Abst. 1796, Vol. 24.)—E. M. Hume.

3063

CHIANCONE, F. M., GINOULHIAC, E., TENCONI, L. T. and BIANCHI DONNASIBILLA, L. L'indice xanturenico nella carenza piridoxinica da dieta o da desossipiridoxina. Influenza della lattoflavina. [The xanthurenic index in vitamin B₆ deficiency caused by a deficient diet or by deoxypyridoxine. Effect of riboflavin.] *Boll. Soc. ital. Biol. sper.*, 1953, **29**, 523-525. [Reperto Biol., Lab. Ricerche, Lepetit S.p.A., Milan.]

Adult male rats weighing about 180 g. were

given a purified diet without pyridoxine. Xanthurenic acid was estimated in the urine for 24 hr. after oral administration of 500 mg. *L*-tryptophan, alone or immediately after a dose of 250 μ g. of pyridoxine or of riboflavin. The increased excretion of xanthurenic acid which followed the giving of tryptophan was unaffected by administration of riboflavin, but returned to normal in the usual manner when pyridoxine was given, no matter whether the state of pyridoxine deficiency had been induced by deprivation or with deoxypyridoxine.—E. M. Hume.

PANTOTHENIC ACID

3064

ŠÍCHO, V. and KAKÁČ, B. Stanovení kyseliny pantothenové rozdělovací chromatografií na papíře. [Estimation of pantothenic acid by partition chromatography on paper.] *Čas. Lék. čes.*, 1953, **92**, 1372-1373. [Res. Inst. Pharm. Biochem., Prague.] Russian summary.

3065

PIERPOINT, W. S. and HUGHES, D. E. The synthesis of coenzyme A by *Lactobacillus arabinosus* 17-5. *Biochem. J.*, 1954, **56**, 130-135. [Med. Res. Counc. Unit Res. Cell Metabol., Dept. Biochem., Univ. Sheffield.]

Cells of *Lactobacillus arabinosus* 17-5 deficient in co-enzyme A were obtained by culture in a semi-synthetic medium used for estimating pantothenic acid (Barton-Wright, *Practical methods for the microbiological assay of the vitamin B complex and essential amino acids*, Ashe Laboratories, London, 1946). Washed suspensions of the cells in glucose and phosphate buffer were incubated for 1 hr. at 37°C. with no supplement, or with pantothenate with or without other substances. Co-enzyme A was extracted and estimated by the method of Handschumacher *et al.* (Abst. 1784, Vol. 21).

Deficient cells synthesised co-enzyme A from pantothenate but the yield was greatly increased when casein hydrolysate was added. Cystine or cysteine was as effective as the hydrolysate and glutathione had some effect, but β -mercaptoethylamine or its N- β -alanyl derivative, cysteic acid, homocystine, methionine, S-methylcystine, thioglycolic acid, thioacetamide or ethanethiol had none. There was no synthesis when glucose was omitted from the medium.

The amount of co-enzyme A formed by the cells was related to the initial content of the cells, those most deficient synthesising most.—V. R. Jackson.

3066

BADDILEY, J., HUGHES, D. E., MATHIAS, A. P. and PIERPOINT, W. S. The phosphorylation

of pantothenic acid by *Lactobacillus arabinosus* 17-5. *Biochem. J.*, 1954, **56**, xxii-xxiii. [Med. Res. Counc. Unit Res. Cell Metabol., Depot. Biochem., Univ. Sheffield.]

3067

BOXER, G. E., OTT, W. H. and SHONK, C. E. Influence of vitamin B₁₂ on the coenzyme A content of the liver of chicks. *Arch. Biochem. Biophys.*, 1953, **47**, 474-475. [Res. Labs., Merck and Co., Inc., Rahway, N.J.]

Co-enzyme A was measured by a modification of the method of Kaplan and Lipmann (Abst. 1921, Vol. 18) in the livers of chicks having a ration based on soya bean with or without a vitamin B₁₂ supplement. After 3, 5 and 7 weeks of the diets chicks deprived of vitamin B₁₂ had values for co-enzyme A about five times as great as those of chicks receiving the vitamin. After 7 weeks the results were confirmed by a phosphotransacetylase method. It is suggested that vitamin B₁₂ may be concerned in the conversion of pantothenic acid into co-enzyme A.—A. M. Copping.

3068

GIROUD, A., LÉVY, G. and LEFEBVRES, J. Recherches sur le taux de l'acide pantothenique chez les mères et les foetus normaux et chez les mères carencées. [Pantothenic acid in normal mothers and foetuses and deprived mothers.] Une carence en acide folique engendre-t-elle chez la rate gestante une carence secondaire en acide pantothenique? [Does deprivation of folic acid cause secondary deficiency of pantothenic acid in the pregnant rat?] *Internat. Ztschr. Vitaminforsch.*, 1954, **25**, 148-153; 153-157. [Lab. Chim. Biol., Fac. Méd., Paris.] German and English summaries.

Adult female rats received a normal diet, or one deficient in pantothenic acid, from 6 days before mating and were killed after 21 days' gestation. Pantothenic acid was estimated in maternal and

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foetal liver. In normal maternal livers the pantothenic acid content in $\mu\text{g.}$ per g. fresh tissue ranged from 63 to 137, average 90, and in normal foetal livers from 28.0 to 48.0, average 33.2. Foetuses from the same mother had similar values, and it is suggested that the differences between adults were due to differences in intestinal flora. In deprived rats the values for the maternal livers were from 40 to 60, average 52. The deficiency was severe and all foetuses were aborted. No sign of deficiency was seen in adult rats, which confirms that it is only with mild degrees of deficiency that malformation of foetuses can occur.

Pantothenic acid was estimated in livers of foetuses and pregnant rats that had received a diet deficient in folic acid with or without added folic acid, and with or without succinylsulphathiazole. All rats received 50 $\mu\text{g.}$ pantothenic acid daily. There was considerable variation among rats in any group, particularly in the group receiving the diet with folic acid but no antibiotic. Average pantothenic acid values in $\mu\text{g.}$ per g. fresh tissue were for maternal livers of the 4 groups, respectively, 60.1, 86.6, 85.4 and 92.2. Corresponding values for the foetuses were 27.5, 32.4, 27.6 and 33.7, so that, where folic acid was not available from diet or from intestinal synthesis, pantothenic acid in the maternal liver was reduced, but the reduction was not reflected in the foetal liver.—V. R. Jackson.

3069

ANGELICO, R. Effetti della carenza di acido pantotenico sulla motilità intestinale. [Effect of pantothenic acid deficiency on intestinal motility.] *Boll. Soc. ital. Biol. sper.*, 1953,

3072

DEL VECCHIO, A. and ORENGO, A. Azione della biotina sulla colesterolesterasi *in vitro*. [Action of biotin on cholesterol esterase *in vitro*.] *Boll. Soc. ital. Biol. sper.*, 1953, 29, 1001-1002.

3073

COLOMBO, O. Rilievi sperimentali sul meccanismo d'azione dell'acido paraminobenzoico. [Experimental results on the mode of action of p-aminobenzoic acid.] *Boll. Soc. ital. Biol. sper.*, 1953, 29, 1169-1172. [Clin. Chirurg., Univ. Pisa.]

Rats given 20 or 30 mg. Pentothal per kg. body-

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29, 566-569. [Lab. Biol., Ist. Superiore Sanità, Rome.]

Rats weighing from 50 to 60 g. were given a diet deficient in pantothenic acid, with or without addition of 100 mg. Ca pantothenate per kg. diet. The rats were killed from 30 to 35 or from 50 to 55 days later, when the deprived animals began to show signs of deficiency. The small intestine showed no histological change, and at post-mortem examination intestinal distension and lack of tone were very rare. There was no change in rhythm or in response to acetylcholine or adrenaline in the isolated intestine of the deprived rats, and addition of Ca pantothenate to the preparation had no effect. Response to eserine or prostigmine also was unaffected. The rate of passage of animal charcoal through the intestine was accelerated in the deprived rats.—E. M. Hume.

3070

RALLI, E. P. and DUMM, M. E. Relation of pantothenic acid to adrenal cortical function. *Vitamins and Hormones*, 1953, 11, 133-158. [Dept. Med., Coll. Med., New York Univ.-Bellevue Med. Centre.]

3071

ATERMAN, K. Studies in fibrosis of the liver induced by carbon tetrachloride. 3. Pantothenic acid and liver fibrosis. *Arch. Pathol.*, 1954, 57, 26-29. [Dept. Anat., Med. Sch., Univ. Birmingham.]

With rats on stock diet addition of 0.1 per cent. of Ca pantothenate did not prevent the development of fibrosis of the liver produced by repeated injections of CCl_4 .—W. M. Deans.

See also Absts. 2995, 3445.

BIOTIN

[Centro Enzimol. C.N.R., Ist. Chim. Biol., Univ. Naples.]

Free cholesterol was estimated in dog's serum before and after incubation for 24 hr. with or without addition of biotin. Biotin was wholly without effect.—E. M. Hume.

p-AMINO BENZOIC ACID

weight became unconscious more quickly, and remained so longer, when 200 or 500 mg. p-aminobenzoic acid per kg. bodyweight had been given previously.

In large doses of from 250 to 2500 mg. per kg. bodyweight, p-aminobenzoic acid had some effect in mitigating the convulsive and fatal effects of strychnine on rats.—E. M. Hume.

3074

- DE VITA, P. Acido *p*-aminobenzoico e immuno-batteriologia: gli aspetti molteplici dell'azione in vitro e in vivo. [*p*-Aminobenzoic acid and immuno-bacteriology: the many aspects of its action in vitro and in vivo.]

Acta vitaminol., 1954, **8**, 25-31. [Ist. Clin. Med., Univ. Bari.] French, English, German and Spanish summaries.

A review.

See also Abst. 3449.

FOLIC ACID (PTEROYLGLUTAMIC ACID)

3075

- BRIGGS, G. M., SPIVEY, M. R. and ORTIZ, L. O. Variation of growth in successive experiments with folic acid-deficient chicks and the influence of aureomycin. *J. Nutrition*, 1953, **51**, 355-364. [Nat. Inst. Arthritis Metabol. Dis., Nat. Inst. Health, Bethesda, Md.]

In each of a series of 14 trials a group of 6 day-old New Hampshire pullets was housed in a wire-floored cage and given to appetite, for 4 weeks, a purified diet of casein, gelatine, methionine, maize oil, minerals, glucose and all identified vitamins with the exception of folic acid. Further groups received the same ration with the addition, per kg. diet, of 3 mg. folic acid, or 50 mg. aureomycin hydrochloride or both.

There were very few deaths of birds receiving folic acid, and the mean finishing weight of each group was within the range of from 330 to 410 g. without aureomycin, and of from 340 to 410 g. with aureomycin.

In the earlier half of the series deaths were infrequent among the chicks receiving no dietary supplement, and the depression of growth and other signs of folic acid deficiency were not severe; comparable groups receiving aureomycin showed more severe signs and were significantly lighter at 4 weeks of age. In the later half of the series more severe signs of deficiency appeared in the unsupplemented groups, and the inclusion of aureomycin had no effect.

The whole series of trials, which covered 18 months, took place in a house not previously used for poultry, and at the end of each experiment most, but not all, of the cages and equipment were sterilised in steam.—K. J. Carpenter.

3076

- CLARK, S. L. (Jr.), DODGEN, C. L. and DARBY, W. J. Further studies on renal toxicity of PGA. *Proc. Soc. Exp. Biol. Med.*, 1953, **84**, 479-480. [Div. Nutrit., Dept. Biochem., Sch. Med., Vanderbilt Univ., Nashville, Tenn.]

Further studies were made of damage to the kidneys in guineapigs receiving large parenteral doses of folic acid (Abst. 1798, Vol. 20). The animals were maintained on a scorbutogenic diet with or without addition of ascorbic acid. Tests were made with solutions of pure crystalline pteroyl-

glutamic acid before or after exposure to sunlight. The lesions were produced by from 6 to 10 daily injections of 8 mg. pteroylglutamic acid, whether untreated or photolysed. No difference due to the presence of products of photolysis could be detected, and there was no difference whether ascorbic acid was given or not. Daily doses of 2 mg. pteroylglutamic acid produced lesions in a few animals.—A. M. Copping.

3077

- BRODY, G. Use of the thymus gland in chicks to elucidate interrelationships between pteroylglutamic acid and biologically related substances. *Science*, 1953, **118**, 720-721. [Dept. Bacteriol., Michigan State Coll., East Lansing.]

Studies were made of the effect of pteroylglutamic acid, vitamin B₁₂, vitamin C and leucovorin on the weight of the thymus gland in chicks infected with *Ascaridia galli*. In absence of pteroylglutamic acid the thymus atrophied. Vitamin B₁₂ restored the gland only partly, but a combination of pteroylglutamic acid and vitamin B₁₂ was more effective than pteroylglutamic acid alone. Addition of vitamin C to the other two vitamins further stimulated development of the thymus. Leucovorin in an amount of 400 µg. per 100 g. diet was as effective as pteroylglutamic acid and vitamin B₁₂ together. The result supported the view that leucovorin is the active form of pteroylglutamic acid.—A. M. Copping.

3078

- BLAKLEY, R. L. Folic acid as coenzyme for the interconversion of serine and glycine. *Biochem. J.*, 1954, **56**, xvii. [Nat. Inst. Med. Res., Mill Hill, London, N.W.7.]

3079

- FATTERPAKER, P., MARFATIA, U. and SREENIVASAN, A. Non-participation of folic acid in the biosynthesis of methyl compounds from precursors. *Nature*, 1954, **173**, 359-360. [Food Sect., Dept. Chem. Technol., Univ. Bombay.]

Groups of mice deprived of folic acid were given for 8 days supplements of 10 µg. folic acid, with or without methanol and serine, or methanol and serine without folic acid. The mice were killed and choline and methionine were estimated in the

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liver, and phosphocreatine in the muscles. Those given folic acid, or methanol and serine, showed an increase in choline, methionine and phosphocreatine over those given no supplements; those given all 3 showed the highest values except for phosphocreatine, the value for which was inferior to that when folic acid only was given. The results are discussed with reference to those of Verly *et al.* (Abst. 1997, Vol. 22), with which they are not in accord.—A. M. Copping.

3080

STRENGTH, D. R., MONDY, N. I. and DANIEL, L. J.
The effect of aminopterin on diphosphopyridine nucleotide. *Arch. Biochem. Biophys.*, 1954, **48**, 141-148. [Dept. Biochem. Nutrit., Cornell Univ., Ithaca, N.Y.]

3081

SKIPPER, H. E., BELL, M. and THOMSON, J. R.
Partial reversal of the antileukemic activity of A-methopterin by cortisone. *Cancer Res.*, 1954, **14**, S6-S7. [Biol. Lab., S. Res. Inst., Birmingham, Ala.]

Groups of 10 mice were inoculated intraperitoneally with one of 2 types of leukaemic cells. After 24 hr. they were treated with A-methopterin, cortisone or both, every other day for 10 injections or until death. A-methopterin increased survival time, cortisone had no effect. When both were given, cortisone reduced significantly the anti-leukaemic effect of A-methopterin.

V. R. Jackson.

3082

SILVER, M. **The role of folic acid in hormonally-induced tissue growth.** *J. Endocrinol.*, 1953-1954, **10**, 95-110. [Nat. Inst. Res. Dairying, Univ. Reading.]

When folic acid deficiency was induced in female rats by means of aminopterin the growth of the mammary glands and uterus in response to a maximum dose of oestradiol dipropionate was considerably less than in pair-fed rats having no folic acid antagonist. The inhibition of the uterine response to oestrogen was less marked than that of the mammary gland. On administration to pigeons of a synthetic diet containing aminopterin, the growth of the crop gland in response to prolactin was decreased, though no signs of folic acid deficiency could be recognised. The response to prolactin was restored if folic acid or citrovorum factor was given at the same time as aminopterin. The results are discussed with reference to other reports on the relation of folic acid to hormone response.—A. M. Copping.

3083

GOLDIN, A., MANTEL, N., GREENHOUSE, S. W., VENDITTI, J. M. and HUMPHREYS, S. R.

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Estimation of the antileukemic potency of the antimetabolite aminopterin, administered alone and in combination with citrovorum factor or folic acid.

Effect of delayed administration of citrovorum factor on the antileukemic effectiveness of aminopterin in mice. *Cancer Res.*, 1953, **13**, 843-850; 1954, **14**, 43-48. [Lab. Chem. Pharmacol., Nat. Cancer Inst., Bethesda, Md.]

Male mice inoculated with lymphoid leukaemia received, 3 days after inoculation, subcutaneous injections of aminopterin alone, simultaneously, or with citrovorum factor or folic acid, or 1 hr. after folic acid. Deaths due to aminopterin occurred from 3 to 6 days after its administration and those due to the tumour from 13 to 16 days after inoculation. The results were examined statistically.

With all combinations of doses, as the amount of aminopterin increased, there was an increase in the mortality due to aminopterin and in the survival times in relation to the leukaemia after survival from the antivitamin.

When citrovorum factor was given with the aminopterin, or when folic acid was given 1 hr. before it, there was reduction in the mortality from the antivitamin and in the survival time relative to the same dose of aminopterin given alone. In groups with the same mortality from aminopterin, those receiving aminopterin alone survived longer than those receiving it with citrovorum factor or after folic acid. Folic acid given at the same time as aminopterin did not affect mortality or survival time.

In discussion it is suggested that the best results might be got by giving an ordinarily lethal dose of aminopterin followed by a massive dose of citrovorum factor before extensive damage to the host had been caused.

Another experiment was designed which showed that treatment of leukaemic mice with aminopterin, followed after from 12 to 24 hr. by citrovorum factor, was more effective in prolonging survival time than treatment with aminopterin alone. Citrovorum factor given at that time reduced the mortality due to aminopterin but did not reduce its antileukaemic action.

V. R. Jackson.

3084

BUCHANAN, D. J., PEARSON, W. N., AMARASINGHAM, C., HUDSON, G. W. and DARBY, W. J.
Citrovorum factor and irradiation injury. *Amer. J. Physiol.*, 1953, **175**, 437-439. [Dept. Biochem., Sch. Med., Vanderbilt Univ., Nashville, Tenn.]

An increase of folic acid activity in the urine was found in rats exposed to X-rays (Abst. 4196, Vol. 23), so an attempt was made to control the effects of exposure by administration of citrovorum

factor, which is a highly active folic acid metabolite. Rats which received injections of 1 mg. citrovorum factor daily for 5 days before, and 28 days after, exposure showed no detectable difference in weight change, food intake or development of leucopenia, from rats having injections of saline or no treatment.—A. M. Copping.

3085

FOLEY, G. E. and HALEY, E. C. **Synthesis of citrovorum factor by *Leuconostoc citrovorum*; potentiation by ascorbic acid.** *J. Bacteriol.*, 1953, **66**, 727. [Labs. Microbiol., Child. Cancer Res. Found., Harvard Med. Sch., Boston, Mass.]

Tests with washed buffered suspensions of *Leuconostoc citrovorum* showed that citrovorum factor was synthesised from pteroylglutamic acid in the presence of suitable concentrations of ascorbic acid.

Dihydropteroylglutamic acid could replace citrovorum factor in the absence of ascorbic acid or other reducing agents, and tests with dihydro- or formylated pteroylglutamic acid suggested that the need for a reducing agent was related intimately to the reduction of pteroylglutamic acid or its

formylated form in the synthesis or citrovorum factor by the organism.

It is thought that the reducing agents acted by direct activation of an enzyme system or by protection of a labile intermediate.—V. R. Jackson.

3086

JANDL, J. H. (with HIRSHBERG, E. A. and DeCARLI, L. M.) **Failure of cortisone and hydrocortisone to replace pteroylglutamic acid and citrovorum factor in microbial growth.** *Proc. Soc. Exp. Biol. Med.*, 1954, **85**, 166. [Thorndike Mem. Lab., Second and Fourth Med. Serv. (Harvard), Boston City Hosp., Mass.]

Streptococcus faecalis, *Lactobacillus casei* and *Leuconostoc citrovorum* were incubated in media with or without pteroylglutamic acid or citrovorum factor but with added cortisone, cortisone acetate or hydrocortisone in amounts ranging from 0.1 to 500 μ g. per ml.

No growth occurred in media without pteroylglutamic acid or citrovorum factor, and there was no enhancement of growth by the steroids when added to media with these vitamins, over a wide range of concentrations.—V. R. Jackson.

See also Abst. 3306.

VITAMIN B₁₂

3087

VAN KLAVEREN, F. W. and SHRIVASTAVA, P. C. **The lead anaemia in the rabbit and the potency of liver extracts. 2.** *Internat. Ztschr. Vitaminforsch.*, 1954, **25**, 139–147. [Res. Dept., Teddington Chemical Factory, Ltd., Surén Rd., Andheri, Bombay.] German and French summaries.

In rabbits with lead anaemia, the haemopoietic effect of whole liver extracts was compared with that of vitamin B₁₂. The results agreed with those found by photometric estimation of the vitamin B₁₂ content of the liver extracts. The haemopoietic potency of the liver extract was extracted quantitatively by a mixture of phenol and chloroform; the aqueous residue was inactive. The biological and photometric methods both gave the content of the whole vitamin B₁₂ in the liver extract.—M. B. Richards.

3088

GAUDIANO, A. **Metodo per la determinazione chimica della vitamina B₁₂ negli estratti epatici. [Chemical method for estimating vitamin B₁₂ in liver extracts.]** *Boll. Soc. ital. Biol. sper.*, 1953, **29**, 471–473. [Lab. Biol., Ist. Superiore Sanità, Rome.]

The chief steps in the estimation were transformation of all forms of vitamin B₁₂ to cyano-

cobalamin by treatment with KCN, removal of impurities by means of butanol and a saturated solution of (NH₄)₂SO₄, extraction with water, reduction to dryness, ashing and, after other treatments including addition of α -nitroso- β -naphthol, estimation by spectrophotometry. The method was applicable to amounts of from 50 to 100 μ g. vitamin B₁₂ at concentrations of not less than 1 μ g. per ml.—E. M. Hume.

3089

WIJMEGA, H. G., THOMPSON, K. W., STERN, K. G. and O'CONNELL, D. J. **Preparation and properties of a cobalamin protein.** *Biochim. biophys. Acta*, 1954, **13**, 144–146. [Labs. N. V. Organon, Oss, Netherlands.]

A complex of cobalamin with protein was obtained by combining crystalline vitamin B₁₂ with extracts of gastric mucosa from the pyloric region of the pig. A highly purified pink protein complex was isolated by electrophoretic analysis. The compound had well defined physicochemical properties and a molecular weight of about 100,000. It appeared to be a chemical compound, a cobalamin protein, and not an adsorption complex. The purified cobalamin protein did not appear to possess clinical haematological activity, but such activity was present in crude preparations in proportion to their vitamin B₁₂ potency. The

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possible role of the purified cobalamin protein as a component of Castle's intrinsic factor is under investigation.—A. M. Copping.

3090

ARMITAGE, J. B., CANNON, J. R., JOHNSON, A. W., PARKER, L. F. J., SMITH, E. L., STAFFORD, W. H. and TODD, A. R. **Chemistry of the vitamin B₁₂ group. 3. The course of hydrolytic degradations.** *J. Chem. Soc.*, 1953, 3849-3864. [Chem. Lab., Univ. Cambridge.]

Products of acid and alkaline hydrolysis of vitamin B₁₂ in a variety of conditions were examined by electrophoretic and chromatographic methods. The results suggested that vitamin B₁₂ contains at least 3 primary amide groups and probably one —CO·NH·CH₂·CHMeO— grouping. Fission of these groups would account for 4 of the carboxyl products obtained in hydrolysis with hot alkali. The amide linkage between aminopropanol and the rest of the molecule, previously suggested (Abst. 5071, Vol. 20), was confirmed. Alkaline hydrolysis with Ba(OH)₂ removed the 5:6-dimethylbenzimidazole nucleotide from the molecule. The nucleotide was isolated in free crystalline form by electrophoretic separation from the cobalt-containing pigment. The stable end-products of strong acid and alkaline hydrolysis contained Co and from 5 to 7 acidic groupings.

A. M. Copping.

3091

JÄNNES, J. **Interrelationship between vitamin B₁₂ and pantothenic acid in the metabolism of "wild" strains of *Escherichia coli*.** *Experimentia*, 1954, 10, 31-33. [Dept. Med. Chem., Univ. Helsinki.] German summary.

3092

DI GUARDI, N. and CARRARA, P. Considerazioni intorno all'azione catalizzatrice della vitamina B₁₂ sulla N₁-alchilazione dell'anello piridinico. [Catalytic action of vitamin B₁₂ on the N₁-alkylation of the pyridine ring.] *Acta vitaminol.*, 1953, 7, 237-239. [Ist. Clin. Med. Gen., Univ. Milan.] French, English, German and Spanish summaries.

Two groups of 10 rats 3 months old, receiving a complete diet, were given subcutaneously 5 mg. N¹-methylnicotinamide daily per kg. bodyweight; after 3 days one group received subcutaneously in addition 0.5 µg. vitamin B₁₂ daily. In the 24-hr. urine of the rats given vitamin B₁₂, the amount of pyridine N¹-alkylates estimated by the reaction of Roggen (Abst. 1033, Vol. 17) was greater than in that of the rats not given vitamin B₁₂, but the amount of pyridine N¹-alkylates having a lateral chain of the type CONH₂ in position 3, estimated by the reaction of Huff (Abst. 433, Vol. 17), was not increased.—E. M. Hume.

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3093

HENDLIN, D. and WALL, J. C. **Relationship between vitamin B₁₂ oxidation product and sodium chloride toxicity for lactobacilli** *J. Bacteriol.*, 1954, 67, 38-40. [Res. Labs., Merck and Co., Inc., Rahway, N.J.]

In an investigation of the report of Beiler *et al.* (Abst. 3498, Vol. 21) that an oxidation product of vitamin B₁₂ formed with H₂O₂ in strongly acid solution inhibited growth of *Lactobacillus leichmannii*, it was found that the inhibition was caused by high concentration of NaCl in the oxidation mixture. Moreover, it was found that vitamin B₁₂ could reverse the inhibition due to NaCl for several strains of lactobacilli, though not for *L. lactis*, Dorner.—A. M. Copping.

3094

MÁNYAI, S. **Stoffwechseleränderungen im Laufe der Entwicklung der roten Blutkörperchen. 1. Untersuchungen mit dem Blut verschieden alter Ratten. [Metabolic changes during the development of red blood cells. 1. Experiments with the blood of rats of different ages.]** *Acta physiol. hung.*, 1954, 5, 19-29. [Med. Chem. Inst., Med. Univ., Budapest.] Russian summary.

Adenosinetriphosphate (ATP), the glycolytic activity of the red cells, and the size of the red cells, were estimated in blood from 325 rats of ages from newborn to 12 months. In suckling rats ATP ranged from 1890 ± 640 to 4610 ± 910 µg. per ml. red cells, with correspondingly high production of lactic acid. From about 8 weeks of age the values fell to adult levels of about 800 µg. ATP per ml. and of from 8725 to 990 µg. lactic acid per ml. The mean diameter of the red cells was greater in young rats, and fell from 9.93 µ. at birth to 6.21 µ. at a year. The packed cell volume at maturity was only one-quarter of that of newborn animals.

In a second experiment the effect of vitamin B₁₂ on the blood of rats was investigated in 55 young from mothers on a stock diet and in 54 young from mothers having a supplement of vitamin B₁₂ during pregnancy. In the latter the ATP content of the whole blood and of the red cells, and the size of the red cells, were significantly less than in the rats with no vitamin B₁₂.—A. M. Copping.

3095

GEBAUER, H. **Histologische Veränderungen in Milz und Leber von Albinoratten nach Vitamin B₁₂-gaben und Kobaltfütterung. [Histological changes in the spleen and liver in albino rats after vitamin B₁₂ and cobalt administration.]** *Naturwissenschaften*, 1953, 40, 558-559. [Anst. Vitaminforsch., Potsdam-Rehbrücke.]

The paper is a summary of work to be published in detail in *Vitamine und Hormone*.

The point of attack of vitamin B₁₂ and of Co was studied with young rats weighing about 130 g. and with fully grown rats. Vitamin B₁₂ was given by intramuscular injection or by mouth, 0.5 µg. daily or more, and Co was given, 0.05 µg. per kg. bodyweight, as CoCl₂ or other compounds. The spleen reacted by vacuolisation of lymphocytes, opening-up of the malpighian bodies, especially the border zones, liberation and increased destruction of lymphocytes, and formation of numerous megacaryocytes (giant cells).

In the liver the Kupffer star cells also showed changes. The nuclei were bleached and, especially with Co, divided into clusters of up to 8 cells. Mitotic and amitotic cell-division took place in the liver parenchyma.

Rats from which the spleen was removed survived for only 3 weeks when given vitamin B₁₂ daily, or 6 weeks when given Co and vitamin B₁₂. Their livers showed cloudy swelling, pyknosis, caryorrhexis and finally caryolysis. There were fine precipitates of Fe, differently situated when Co was given from when vitamin B₁₂ was given.

I. Leitch.

3096

LING, C. T. and CHOW, B. F. **The influence of vitamin B₁₂ on carbohydrate and lipid metabolism.** *J. Biol. Chem.*, 1954, **206**, 797-805. [Dept. Biochem., Sch. Hyg. Pub. Health, Johns Hopkins Univ., Baltimore, Md.]

Blood sugar, glucose tolerance and phospholipins in blood and tissues were measured in rats reared on diets deficient in vitamin B₁₂ with and without addition of vitamin B₁₂. Deprivation of vitamin B₁₂ caused a fall of blood sugar and disturbance of glucose tolerance. The phospholipin content of the whole body and of the blood and tissues per unit of weight was much less in those deprived of vitamin B₁₂. A low value for phospholipin was found in the blood of 2 patients with pernicious anaemia and an increase occurred after administration of vitamin B₁₂. When rats were given high-carbohydrate diets and injections of glucose the resulting hyperglycaemia was reduced transiently by subcutaneous injection of glutathione and more markedly by injection of vitamin B₁₂; the glutathione content of the blood was low in the hyperglycaemic rats and also in rats deprived of vitamin B₁₂.

The relation between glutathione and vitamin B₁₂ in fat and carbohydrate metabolism is discussed.—A. M. Copping.

3097

REGISTER, U. D. **Effect of vitamin B₁₂ on liver and blood non-protein sulphhydryl compounds.**

J. Biol. Chem., 1954, **206**, 705-709. [Dept. Biochem., Sch. Med., Coll. Med. Evangelists, Loma Linda, Calif.]

Weanling rats from mothers deprived of vitamin B₁₂ during pregnancy and lactation were given diets with soya bean meal as source of protein with or without addition of vitamin B₁₂. After 5 weeks they were killed and total sulphhydryl groups, glutathione and ergothioneine were estimated in the liver and red blood cells. The rats having no vitamin B₁₂ had less sulphhydryl compounds, especially glutathione, in the liver and blood. There was little difference in the ergothioneine content, which was one-tenth or less of the glutathione content. A diet containing maize-meal and soya bean meal gave higher values for total sulphhydryl groups than one containing soya bean meal and dextrose. The role of glutathione in enzyme systems concerned with fat and carbohydrate metabolism is discussed with reference to the effects of vitamin B₁₂ on the glutathione content of the liver and blood.—A. M. Copping.

3098

RUBINO, F. **Azione della vitamina B₁₂ nei colombi sperimentalmente ipertiroidizzati. [Action of vitamin B₁₂ on pigeons experimentally rendered hyperthyroid.]** *Boll. Soc. ital. Biol. sper.*, 1953, **29**, 981-982. [Ist. Fisiol., Univ. Palermo.]

Oxygen consumption and weight loss of 6 pigeons given 0.5 mg. thyroxine daily for 3 or 6 days were in no way affected by simultaneous administration of 30 µg. vitamin B₁₂.

E. M. Hume.

3099

BOSCHI, E. and GASPARI, A. **Su di un effetto analgesico della vitamina B₁₂. [An analgesic effect of vitamin B₁₂.]** *Boll. Soc. ital. Biol. sper.*, 1953, **29**, 636-640. [Reperto Traumatol. INAIL, Osp. Civ., Padua.]

The sciatic nerve of rabbits was exposed and subjected to electrical or contact stimulation; local application to the nerve of vitamin B₁₂ had no effect, whether it was given alone or with novocaine. Parenteral administration of the vitamin reduced the response.

A favourable effect on pain is claimed in human subjects with old surgical lesions such as amputation stumps, or requiring surgical treatment; the action was greatest when the vitamin was injected.

E. M. Hume.

3100

MENNA, F. and ROSATI, P. **Azione della vitamina B₁₂ e della teropterina sui tagli corneali. Ricerche sperimentali in *Lepus cuniculus*. [Action of vitamin B₁₂ and of teropterin on corneal incisions. Experiments with *Lepus***

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cuniculus.] *Boll. Soc. ital. Biol. sper.*, 1953, **29**, 1191-1193. [Reperto Oftalmico, Osp. Pellegrini, Naples.]

3101

ERSHOFF, B. H. **Decreased resistance of vitamin B₁₂-deficient rats to cold stress.** *Proc. Soc. Exp. Biol. Med.*, 1953, **84**, 615-617. [Emory W. Thurston Labs., Los Angeles, Calif.]

Groups of weanling female rats receiving a purified diet with soya bean flour as source of protein grew equally well with or without addition of 100 µg. vitamin B₁₂ per kg. diet during 12 weeks at a room temperature of about 23° C. When rats on the same two diets were kept at 2° C., 15 out of 20 having vitamin B₁₂ survived with an average weight increase of 93.5 ± 4.9 g.; of those having no vitamin B₁₂, 14 out of 20 survived with an average weight increase of 69.8 ± 3.0 g. which was significantly less than in the other group. Litters obtained from the rats kept at room temperature were given the experimental diets at weaning and those bred and reared on the diet without vitamin B₁₂ died during the first 96 hr. of exposure to the low temperature, 30 days after weaning.—A. M. Copping.

3102

CALET, C., RERAT, A. and JACQUOT, R. **Signification des relations entre auréomycine et vitamine B₁₂.** [Significance of the relations between aureomycin and vitamin B₁₂.] Essai d'interprétation du rôle de l'auréomycine comme facteur de croissance. [Interpretation of the role of aureomycin as growth factor.] *C.R. Acad. Sci.*, 1954, **238**, 938-940; 1071-1073.

With a basal diet containing per cent. white flour 85, arachis oil 8, and salt mixture 4, with all vitamins except vitamin B₁₂, the growth of rats was not improved by vitamin B₁₂ but was considerably increased by aureomycin. Vitamin B₁₂ with aureomycin was no more effective than aureomycin alone. The vitamin B₁₂ content of the livers was not raised in rats given aureomycin.

In a further study of the effect of aureomycin on weight gain and utilisation of food by rats on a complete, purified diet, it was shown that aureomycin was more effective alone than with vitamin B₁₂. The greater weight gain was not caused by improved digestibility or by increased retention of water or protein, but appeared to be due to early deposition of fat.—A. M. Copping.

3103

BURNSIDE, J. E., GRUMMER, R. H., PHILLIPS, P. H. and BOHSTEDT, G. **The influence of crystalline aureomycin and vitamin B₁₂ on the protein**

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utilization of growing-fattening swine. *J. Animal Sci.*, 1954, **13**, 184-200. [Dept. Animal Husb., Univ. Wisconsin, Madison.]

The effect was studied of adding 20 µg. vitamin B₁₂ and 20 mg. aureomycin per kg. diet, singly or together, on the rate of weight gain, efficiency of feed utilisation, Hb, and plasma protein, of weanling pigs growing to an average bodyweight of 213 lb. on basal diets containing initially 21, 17 and 12.6 per cent. protein. The protein came from maize, soya bean meal and alfalfa meal and the percentage in the diets was reduced, respectively, to 17, 13.7 and 10.4 when the groups averaged 70 lb., and to 15, 11.5 and 9.8 at 126 lb.

In these conditions vitamin B₁₂ alone had little or no effect on the growth or blood picture of the pigs. Aureomycin alone did not improve growth in the pigs having the high protein intake but in those with medium or low protein intake it improved the performance, judged by growth and blood picture. In the group having high protein, aureomycin alone appeared to be slightly detrimental, especially after the pigs weighed 70 lb., when an increased need for vitamin B₁₂ seemed to arise. Aureomycin and vitamin B₁₂ together improved utilisation of protein in all groups. Significant correlations between growth and blood constituents were found for all groups.

A. M. Copping.

3104

HALBROOK, E. R., BEECKLER, A. F. and SMITH, E. P. **The value of fish solubles and a vitamin B₁₂-antibiotic supplement in chicken and turkey mash mixtures containing ten per cent. meat scraps.** *Poultry Sci.*, 1953, **32**, 1058-1068. [Dept. Poultry Indust., Montana State Coll., Bozeman.]

In a trial lasting 16 months 4 rations were tested with chicks, and poults, from day-old through their first laying year. One ration was of meat scraps (55 per cent. protein) 10, soya bean meal 15, alfalfa meal 10, ground wheat 40, ground oats 20, minerals, fish oil and riboflavin; another had the same composition except that the cereals were yellow maize meal 20, ground wheat 10, ground oats 10, wheat middlings 10 and wheat bran 10. Each of the rations was given alone or with 3 per cent. condensed fish solubles added at the expense of the soya bean meal.

The birds were kept for 12 weeks in electric brooders with litter on the floor, then transferred to alfalfa range and finally brought back into laying pens with litter floors at 24 weeks of age. Each ration was given to one group of 250 New Hampshires, one of 250 White Leghorns, and one of 100 Bronze poults.

At no point did the difference in cereals used appear to affect performance. At 12 weeks of age

the groups receiving fish solubles were from 1 to 6 per cent. heavier than those without. The males killed at 12 weeks as broilers did not significantly differ in carcase quality through the different treatments. At 24 weeks the pullets receiving fish solubles were not significantly heavier than those without, nor was their egg production or the hatching capacity of the eggs consistently affected.

A further trial of similar design was made but 0.02 p.p.m. vitamin B₁₂ and 20 p.p.m. aureomycin were added to the rations instead of the fish solubles. At 12 weeks chicks of both breeds receiving this supplement were, respectively, 5 and 11 per cent. heavier than those without it, and the respective average percentage mortality was 4.4 compared with 9.8 for the unsupplemented groups. The poultts receiving the supplement were 17 per cent. heavier than those without, and the total percentage mortality was 9.5 compared with 24.3 for those without supplement. The males were again marketed as broilers at 12 weeks; in market grading the chickens appeared to benefit from the supplement, but the poultts were, if anything, adversely affected. During the next 12 weeks the pullets lost most of the extra weight attributed to the supplement and the percentage mortality was 6.8 in the groups with supplement compared with 4.6 in those without. In the laying period there was no evidence of any effect of the supplement on egg production or mortality. Hatching capacity was slightly less in the groups with the supplement.

At 6 months of age the breeding turkeys that received the supplement of vitamin B₁₂ and aureomycin were 5 per cent. heavier than those without, but egg production and hatching capacity were, respectively, 12 and 7 per cent. less than for those without. There was no difference in mortality.

It is concluded that the study provided no evidence to support the use of vitamin B₁₂ and an antibiotic as supplement for replacement pullets and laying birds with the basal rations and management used.—K. J. Carpenter.

3105

GORDON, R. F., CHUBB, L. G. and STACEY, C. G. **Vitamin B₁₂ and penicillin supplements in poultry nutrition.** *Vet. Rec.*, 1954, **66**, 71-74. [Poultry Res. Stat., Animal Health Trust, Houghton Grange, Huntingdon.]

Groups of 50 crossbred chicks were reared intensively on sawdust litter, which was changed weekly. They received an adequate standard ration of oats, wheat and wheat middlings, maize and maize gluten feed, grassmeal, white-fish meal, dried milk, dried yeast, minerals, vitamin D and riboflavin, with or without vitamin B₁₂ or penicillin or both, or the standard ration modified by

replacing the fishmeal wholly or partly by groundnut meal, with or without the addition of a supplement of vitamin B₁₂. At 16 weeks of age the cockerels were killed and the pullets transferred to laying cages. Dried milk was omitted from the rations.

The addition of penicillin to the standard ration did not improve growth or the production and hatching capacity of the eggs. When the ration contained groundnut meal and added vitamin B₁₂ growth was not as good as when as little as 5 per cent. fishmeal was the source of protein. On a solely vegetable diet, fewer eggs were produced than on a diet containing animal protein and a supplement of vitamin B₁₂ conferred no advantage. Addition of vitamin B₁₂ and penicillin to the standard ration did not increase production. The hatching capacity of eggs from caged pullets was increased by a vitamin B₁₂ supplement but was less than on a ration containing fishmeal. The addition to the standard ration of both penicillin and vitamin B₁₂ slightly increased the percentage of fertile eggs which hatched.—E. M. Cruickshank.

3106

CARLSON, C. W., JONES, D. G., KOHLMAYER, W. and MOXON, A. L. **The effects of vitamin B₁₂ and aureomycin on reproductive performance in turkeys.** *Poultry Sci.*, 1953, **32**, 984-989. [S. Dakota Agric. Exp. Stat., College Station.]

Twenty-five turkey hens, about 30 weeks of age, and 2 toms, were housed in each of 4 breeding pens which were floored with deep straw litter and opened on to a cobblestone yard. For the next 17 weeks all the pens received a diet of soya bean meal 13, alfalfa meal 3, yellow maize meal 40, ground oats 29, wheat standard middlings 10, minerals and riboflavin. One pen received no supplement, and the other 3 received, per kg. diet, 11 mg. aureomycin hydrochloride or 8.8 µg. vitamin B₁₂ or both.

There were only small differences between the pens in egg production, fertility and hatching capacity. For the 4 treatments the numbers of poultts obtained per 100 hen-days were 25.7, 25.8, 26.4 and 27.6 per cent., respectively.

When the poultts were reared on rations rich in vitamin supplements their rate of growth appeared to be independent of the diet on which the dams were fed. With less well fortified starter rations the progeny of dams receiving the supplemented diets gave slightly faster growth to 4 weeks of age, but the results of 2 different hatches were not consistent.—K. J. Carpenter.

3107

FRÖLICH, A. **Relation between the quality of soybean oil meal and the requirements of**

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vitamin B₁₂ for the chicks. *Nature*, 1954, **173**, 132-133. [Nat. Animal Exp. Stat., Upsala.]

Irregularities in the response of chicks to pure vitamin B₁₂ suggested that the quality of the soya bean oil meal used in the basal diet had to be examined. Three samples of meal were tested for antiproteolytic activity, percentage of water-soluble protein, urease activity, formaldehyde titration and phenolphthalein adsorption. The tests showed that 2 of the meals had not been sufficiently heated and were of poor quality. In growth experiments with chicks these 2 samples gave a less satisfactory response than the third, which contained little water-soluble protein and had no antiproteolytic activity. With meals of poor quality the requirement for vitamin B₁₂ appeared to be increased.—A. M. Copping.

3108

WOLFF, R. and KARLIN, R. Sur la combinaison du sérum de quelques mammifères avec la vitamine B₁₂. [Combining power of the serum of some mammals with vitamin B₁₂.] *Bull. Soc. Chim. biol.*, 1953, **35**, 1409-1413. [Lab. Chim. Biol., Fac. Méd., Nancy.]

Free and total vitamin B₁₂ was estimated with *Lactobacillus leichmannii* in untreated serum and in serum autoclaved in the presence of cyanide. The different species studied were rabbit, sheep, goat, horse, calf, dog and pig. The values for rabbit blood were the highest, average 43.3 μg . per ml. Vitamin B₁₂ in the serum appeared to be bound in a thermolabile protein complex which could combine with further vitamin B₁₂ added *in vitro*. Only when vitamin B₁₂ was present in

excess of the amount which the protein could bind was there free vitamin B₁₂ in the blood.

A. M. Copping.

3109

KARLIN, R. and WOLFF, R. Répartition de la vitamine B₁₂ dans le sérum sanguin de quelques mammifères. [Distribution of vitamin B₁₂ in the blood serum of some mammals.] *C.R. Soc. Biol.*, 1953, **147**, 1387-1389. [Inst. Bactériol., Lyons.]

The vitamin B₁₂ content of blood serum was estimated with *Lactobacillus leichmannii* in serum autoclaved at pH 5.1 to liberate the vitamin from its protein complex. The average values obtained in μg . per ml. were for rabbit 43.2, sheep 4.5, horse 3.16, guineapig 1.44, ox 0.34 and pig 0.32. The range of values for individuals of the same species was very wide.—A. M. Copping.

3110

SCHENDEL, H. E. and JOHNSON, B. C. Feed from sewage. Activated sewage sludge as a source of vitamin B₁₂ for the pig. *J. Agric. Food Chem.*, 1954, **2**, 23-24. [Div. Animal Nutrit., Univ. Illinois, Urbana.]

Addition of 2 per cent. dried, activated sewage sludge to a synthetic milk containing alpha-protein from soya bean improved growth and feed utilisation in baby pigs to the same extent as an adequate supplement of 0.5 μg . vitamin B₁₂ per kg. body-weight. The dried sludge contained 3.11 μg . vitamin B₁₂ activity per g. and during the 5-week test period inclusion of sludge in the diet appeared to do the little pigs no harm.—A. M. Copping.

See also Absts. 3016, 3067, 3068, 3306.

OTHER B VITAMINS

3111

FRENCH, E. W. and FRAENKEL, G. Carnitine (vitamin B_T) as nutritional requirement for the confused flour beetle. *Nature*, 1954, **173**, 173. [Dept. Entomol., Univ. Illinois, Urbana.]

Larvae of the flour beetle, *Tribolium confusum*, Duval, received a diet containing casein 50, glucose 50, cholesterol 1, and salt mixture 1 part, vitamins B₁ and B₆, riboflavin, nicotinic, pantothenic and folic acids, choline, biotin and inositol with or without supplements of whole yeast or a water-soluble fraction of it or carnitine (vitamin B_T). Larvae in groups with or without the supplements had similar weights, survival times and times to pupation, and the pupae were similar. Most adults without supplements died soon after emergence, before tanning and hardening of the cuticle, but those with supplements were normal.

It is concluded that carnitine is a dietary essential for *Tribolium confusum*.—V. R. Jackson.

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3112

LECLERCQ, J. Action vitaminique de la "DL-dicarnitine" chez "Tenebrio molitor L" (insecte, coléoptère). [Vitamin action of DL-dicarnitine in *Tenebrio molitor*, L. (Insecta, Coleoptera).] *Arch. internat. Physiol.*, 1954, **62**, 101-108. [Inst. Léon Fredericq, Univ. Liège.]

Two strains of *Tenebrio molitor* larvae, F and G, received the synthetic diet described by Fraenkel *et al.* (Abst. 1587, Vol. 20) slightly modified, with or without the addition of "dicarnitine", a dimer of carnitine.

All larvae deprived of dicarnitine died within 10 weeks, generally after from 4 to 6 weeks, with signs of carnitine deficiency. Of the larvae receiving dicarnitine, of strain F 20 per cent. and of strain G 65 per cent. died within 10 weeks; they were not pigmented and showed signs like those in deprived larvae. Weights of the surviving nymphs were less than of those on natural diet. A number

survived to metamorphosis but, at this stage, mortality was similar in the 2 strains, 54 and 59 per cent. Nymphs of strain F which survived gave rise to abnormal adult forms and of strain G to normal forms. The results differed from those obtained by Fraenkel with carnitine, but it could not be stated whether the discrepancy was due to difference between the properties of carnitine and dicarnitine, to toxicity of the amount of biotin used in the diets, or to difference in sensitivity of the strains of *Tenebrio* employed.—V. R. Jackson.

3113

VERLY, W. G. and BACQ, Z. M. Prise oralement, la "dicarnitine" racémique n'est pas un bon donneur de méthyl pour le rat. [**Racemic dicarnitine, given orally, is not a good methyl donor for the rat.**] *Biochim. biophys. Acta*, 1954, **13**, 454-455. [Lab. Pathol. Gén., Univ. Liège.]

Weanling albino rats received for 5 days a complete basal diet as described by Du Vigneaud *et al.* (Abst. 4604, Vol. 9) and then in 4 groups received for 8 days the complete diet, or the diet with methionine replaced by homocystine alone or with choline or racemic dicarnitine. Racemic dicarnitine was formed by esterification of 2 molecules of carnitine (vitamin B_T), one acting as alcohol and the other as acid. All rats received vitamin B₁₂.

Rats having the complete diet containing methionine or the diet with homocystine and choline grew well. Growth of those having homocystine alone or with racemic dicarnitine stopped as soon as they received those diets; some died and in others growth recommenced after from 12 to 16 days, presumably because of synthesis of labile methyl groups. Post-mortem examination showed that rats having the complete diet or the diet with homocystine and choline were macroscopically normal; those in the other groups had enlarged livers and lesions in the kidneys. It is concluded that racemic dicarnitine is not a good methyl donor for the rat.—V. R. Jackson.

3114

FRAENKEL, G. Studies of the distribution of vitamin B_T (carnitine). *Biol. Bull.*, 1953, **104**, 359-371. [Dept. Entomol., Univ. Illinois, Urbana.]

Finely ground, dried powders or extracts of animal and vegetable matter were added to a synthetic diet and the rate of growth of *Tenebrio* larvae was recorded. If the survival of the larvae reached the optimum, and the larvae attained an average weight of 60 mg. after from 9 to 10 weeks at 30° C. and 60 per cent. relative humidity, the vitamin B_T (carnitine) content of the diet was taken to be 0.35 mg. per g. dry diet. This criterion was satisfied by from 1 to 4 per cent. of dried

brewer's yeast, *Torula utilis* or *Neurospora*, in the diet. *Bacterium coli* and *Tetrahymena geleii* had no carnitine activity; *Streptococcus haemolyticus* showed some activity when included as 1.25 per cent. Wheat had good activity as from 2.5 to 5 per cent. of the diet and spray-dried alfalfa juice as 1.8 per cent. Maize, rye and oats were inactive. Extracts from larvae deprived of carnitine had no vitamin B_T activity; extracts from larvae grown on an optimum diet of wholemeal flour and 5 per cent. yeast gave optimum survival in an amount equivalent to 2 per cent. of dried larvae. It is calculated that larvae retained half of the total intake of carnitine during life. Further, similar tests showed that larvae receiving synthetic diets and amounts of carnitine graded from 1.5 to 50 µg. per g. retained all the carnitine ingested. It is concluded that *Tenebrio* larvae do not synthesise carnitine.

Both *Dermestes vulpinus* and *Phormia regina* grew well on synthetic diets without added carnitine. Extracts from both gave good results with *Tenebrio*, showing that they synthesised carnitine. There was no carnitine in the hen's egg, but a considerable amount in the developing embryo. In dried dog, rat and rabbit tissue the quantities were largest in skeletal muscle with about 1000 µg. per g.; other values ranged from 35 in dried blood to 560 in heart. Paralysis of muscle for several weeks and autolysis of liver did not affect the values. Human whole blood or plasma contained 7 to 14 µg. per ml. and urine from 14 to 264, the highest values being found after ingestion of meat. Meat extracts contained from 1 to 3 per cent. carnitine on dry weight; fish extracts and yeast, including vitamin T (Pharmazell), contained considerably less.—V. R. Jackson.

3115

RABBI, A., PICCIONI, M. and MORUZZI, G. Aspetti della carenza del FPA della caseina nel ratto. [**Aspects of the lack of animal-protein factor in casein in the rat.**] *Boll. Soc. ital. Biol. sper.*, 1953, **29**, 552-553. [Ist. Chim. Biol., Univ. Bologna.]

It is stated that the deficiency caused in rats by the diet of Randoin and Causeret (Abst. 3159, Vol. 17), when the casein is purified, gives rise in the first generation, at the age of about 7 months, to cancerous or precancerous growths in the mammary glands, peritoneum and lungs (see also Title 1851, Vol. 24).—E. M. Hume.

3116

TOMIYAMA, T. and YONE, Y. A new chick growth promoting factor in liver. *Proc. Japan Acad.*, 1953, **29**, 178-182. [Dept. Fishery Chem., Fac. Agric., Univ. Kyushu.]

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A factor called vitamin B15 was prepared as a concentrate by adsorption from a solubilised beef-liver filtrate on activated charcoal at pH 4. The charcoal was washed with dilute HCl and the factor was eluted with dilute NaOH. The concentrate had growth-promoting action for chicks on a

vegetable protein diet over and above the effects of vitamin B₁₂ and folic acid. It also increased the efficiency of feed utilisation in the chick. Some preliminary evidence is presented for the existence of other new growth factors in liver.

A. M. Copping.

VITAMIN C (ASCORBIC ACID)

3117

KING, C. G. **The discovery and chemistry of vitamin C.** *Proc. Nutrition Soc.*, 1953, **12**, 219-227. [Nutrition Foundation, Inc., Chrysler Bldg., New York.]

3118

SETNIKAR, I. and POIDOMANI, M. Dosaggio dell'acido ascorbico e del deidrosascorbicone su un medesimo campione biologico. [Estimation of ascorbic acid and of dehydroascorbic acid in the same biological sample.] *Boll. Soc. ital. Biol. sper.*, 1953, **29**, 549-552. [Lab. Fisiol., Univ. Milan.]

Ascorbic acid was estimated by the methylene blue method of Martini and Bonsignore (Abst. 2197, Vol. 4). It was then oxidised to dehydroascorbic acid and estimated by the method of Roe and Kuether (Abst. 261, Vol. 13) as modified by Meyer *et al.* (Abst. 1709, Vol. 23).—E. M. Hume.

3119

SPANYÁR, P. **The significance of reductones at the biological appraisal of foods.** *Acta chim. hung.*, 1953, **3**, 395-412. [Inst. Res. Canning, Meat Packing and Refrigeration, Budapest.] Russian and German summaries.

The $\alpha\alpha'$ -dipyridyl method of Schulek and Floderer (Abst. 334, Vol. 10) was considered to give the most satisfactory measure of the vitamin C content of foods. The only difficulty was interference from the presence of reductones, which was eliminated by carefully controlled treatment with formaldehyde. The results obtained by the $\alpha\alpha'$ -dipyridyl method for 17 fruits, vegetables and food preparations were compared with results from the dinitrophenylhydrazine method, and found to vary somewhat in the assessment of ascorbic acid and reductones.

The reductones formed during processing and storage of canned foods were investigated, especially those associated with enzymic browning. Reductones formed in foods with high amino-acid content were dark in colour. The pH value of solutions decreased during reductone formation but the extent of the pH change was not related to the amount of reductone formed. The presence of phosphate increased reductone formation.

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Reductones were capable of forming osazones which gave coloured solutions with H₂SO₄, but the colour intensity was less than that of the osazone of dehydroascorbic acid.—A. M. Copping.

3120

MITCHELL, L. C. and PATTERSON, W. I. **The separation and identification of L-ascorbic, D-isoascorbic and D-glucosascorbic acids by paper chromatography.** *J. Assoc. Off. Agric. Chem.*, 1953, **36**, 1127-1130. [Dept. Health, Washington 25, D.C.]

Pure L-ascorbic, D-isoascorbic and D-glucosascorbic acid in mixtures were separated by chromatography on paper impregnated with 1 per cent. metaphosphoric acid, and air-dried. The mobile solvent was a mixture of acetonitrile, acetone, water and glacial acetic acid in the proportion of 80:5:15:1. The spots were detected by spraying with ammoniacal silver nitrate. In these conditions dehydroascorbic acid did not show a spot.—W. Godden.

3121

HUELIN, F. E. **Studies on the anaerobic decomposition of ascorbic acid.** *Food Res.*, 1953, **18**, 633-639. [C.S.I.R.O., Div. Food Preservation, Homebush, N.S.W.]

The anaerobic decomposition of pure ascorbic acid in citrate-phosphate buffer solutions over the pH range 2.2 to 6.0 was studied at 30° and 100° C. The values for ascorbic acid were corrected for "apparent ascorbic acid" by the method of Wokes *et al.* (Abst. 277, Vol. 14). Decomposition occurred most rapidly at pH from 3 to 4 at both temperatures, and was accelerated by the presence of fructose and its 6-phosphate and 1:6-diphosphate. There was some effect with sucrose, apparently due to the liberation of fructose. At high temperature and low pH the main products of decomposition were furfural and CO₂. The results are discussed in relation to the retention of ascorbic acid in canned fruits and vegetables.

W. Godden.

3122

LÜCK, H. **Der Einfluss von komprimiertem Kohlendioxyd und Sauerstoff auf das Vitamin C.** [Effect of compressed carbon dioxide and

oxygen on vitamin C.] *Ztschr. Lebensmittel-Untersuch. Forsch.*, 1954, **98**, 18-25. [Dairy Indust. Control Board, Windhoek, S. Africa.]

Vitamin C in lemon juice was rapidly broken down under CO₂ at 8 atmospheres pressure and 4° or 20° C. unless the CO₂ was free from O₂ and all air had been removed from the vessel. Hydrogen peroxide could be detected among the reaction products and produced an unsatisfactory aroma. Ascorbic acid was very rapidly destroyed under compressed oxygen at 4° and 20° C. One of the products was dehydroascorbic acid but the reaction was a complicated one in which a balance was established with other reaction products.

W. Godden.

3123

MOURIQUAND, G. and EDEL, V. Action du contact de l'air sur une solution d'acide ascorbique. Modification profonde de l'indice chronologique vestibulaire sans modification du pouvoir antiscorbutique. [Effect of contact with air on a solution of ascorbic acid. Marked modification of the index of vestibular chronaxie without modification of antiscorbutic potency.] *C.R. Soc. Biol.*, 1953, **147**, 1802-1804.

When an ampoule of a strong solution of vitamin C was opened and in contact with air for 24 hr., the action of the contents on vestibular chronaxie was reduced without any change in the antiscorbutic potency. A similar observation was previously reported for vitamin B₁ (Absts. 3401, 4987, Vol. 20; 327, Vol. 21).—W. Godden.

3124

MOURIQUAND, G., EDEL, V. and CHIGHIZOLA, R. Modification de l'indice chronologique vestibulaire de l'acide ascorbique sous l'influence de l'air. [Modification of the index of vestibular chronaxie by ascorbic acid subjected to aeration.]

MOURIQUAND, G. and EDEL, V. Sur la persistance du pouvoir antiscorbutique de solutions d'acide ascorbique malgré l'inversion de leur action sur l'indice chronologique vestibulaire par contact de l'air. [Persistence of antiscorbutic potency of solutions of ascorbic acid in spite of the inversion by aeration of their action on the index of vestibular chronaxie.] *Internat. Ztschr. Vitaminforsch.*, 1954, **25**, 199-202; 240-242. [Inst. Nat. Hyg., Paris.] German and English summaries.

3125

MEIKLEJOHN, A. P. The physiology and biochemistry of ascorbic acid. *Vitamins and Hormones*, 1953, **11**, 61-96. [Dept. Med., Univ. Edinburgh.]

3126

ISHERWOOD, F. A. Synthesis of L-ascorbic acid in plants and animals. *Proc. Nutrition Soc.*, 1953, **12**, 335-339. [Low Temp. Res. Stat., Univ. Cambridge.]

3127

MAPSON, L. W. The enzymic conversion of L-galactono-γ-lactone to L-ascorbic acid by plant mitochondria. *Proc. Nutrition Soc.*, 1953, **12**, 339-341. [Low Temp. Res. Stat., Univ. Cambridge.]

3128

ISHERWOOD, F. A., CHEN, Y. T. and MAPSON, L. W. Synthesis of L-ascorbic acid in plants and animals.

Isolation of D-glyceric acid from cress seedlings and its relationship to the synthesis of L-ascorbic acid.

MAPSON, L. W., ISHERWOOD, F. A. and CHEN, Y. T. Biological synthesis of L-ascorbic acid: the conversion of L-galactono-γ-lactone into L-ascorbic acid by plant mitochondria. *Biochem. J.*, 1954, **56**, 1-15; 15-21; 21-28. [Low Temp. Res. Stat., Univ. Cambridge.]

Previous investigations have led to the probability that L-ascorbic acid is synthesised from a hexose which may be D-glucose. The authors have sought to ascertain the nature of the hexose precursor and the mechanism by which D-glucose or D-galactose might be transformed into L-ascorbic acid. Seven schemes are set out by which the transformation might theoretically take place. The one preferred derives L-ascorbic acid from D-glucose by oxidation to D-glucurono-γ-lactone, from which by inversion of configuration and reduction L-gulono-γ-lactone is formed, and from it by oxidation L-ascorbic acid can be derived. By a similar scheme D-galactose could be the original hexose. The schemes were tested by supplying the various compounds postulated as possible intermediates to cress seedlings and to rats. Positive results were obtained with 4 such substances. The results have been briefly reported already (Abst. 2999, Vol. 23).

The 3-carbon compound, D-glyceric acid, was isolated from cress seedlings but was shown not to be a precursor of L-ascorbic acid, though its synthesis was in some way coupled with that of L-ascorbic acid. In rats given chloretone synthesis of ascorbic acid is increased, and it was found that urinary excretion of D-glyceric acid was at the same time doubled. When 100 mg. each of ethyl DL- and D-glycerate were injected subcutaneously into rats, there was no increase in excretion of L-ascorbic acid.

Washed mitochondria were prepared from soaked pea seeds at a stage when oxidase activity would be low. The preparation catalysed the formation of L-ascorbic acid from L-galactono- γ -lactone, but not from L-gulono- γ -lactone or from D-mannono- γ -lactone. The effect of different conditions and substances on the synthesis was studied.

E. M. Hume.

3129

HAGEN, P. **The distribution of ascorbic acid between the particulate and non-particulate components of adrenal and liver cells.** *Biochem. J.*, 1954, **56**, 44-46. [Dept. Pharmacol., Univ. Oxford.]

The preparations were made from ox adrenal glands and dog's liver. The tissues were homogenised and dispersed in ice-cold 0.25 *M* sucrose solution. Fractions were separated by centrifuging at different speeds, and were tested for ascorbic acid by the method of Bessey (Abst. 4625, Vol. 8). From 87 to 100 per cent. of the ascorbic acid in the tissues was in the supernatant fraction from the high-speed centrifuging. There was almost none in the cytoplasmic particles. Resuspended mitochondria from the preparations did not stain black with silver nitrate.

E. M. Hume.

3130

HOROWITZ, H. H. and KING, C. G. **Glucuronic acid as a precursor of ascorbic acid in the albino rat.** *J. Biol. Chem.*, 1953, **205**, 815-821. [Dept. Chem., Columbia Univ., New York.]

When uniformly labelled glucuronolactone- ^{14}C was injected intraperitoneally into chloretone-stimulated rats, 50 per cent. of it was recovered unchanged in the urine in 24 hr., but some of it was recovered as ^{14}C -ascorbic acid, the yield being from 4 to 8 times greater than had been obtained in similar experiments with labelled glucose (Abst. 2998, Vol. 23). The ascorbic acid isolated retained the initial distribution of ^{14}C in the lactone.

W. Godden.

3131

ÅBERG, B. **On the effect of different sugars upon the ascorbic acid content of detached leaves.** *Kgl. Lantbrukshögsk. Ann.*, 1953, **20**, 125-138. [Inst. Plant Physiol.]

Detached parsley and oat leaves were kept with their cut surfaces in different sugar solutions in darkness at controlled temperatures. D-Sucrose, D-glucose, D-fructose, D-mannose and D-galactose all increased ascorbic acid content to about the same extent; D-xylose gave slightly smaller increases and L-arabinose, L-sorbose and 2-keto-L-gulonic acid had little or no effect. The results gave no certain information about ascorbic acid precursors.—W. Godden.

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3132

WOLBACH, S. B. **Experimental scurvy. Its employment for the study of intercellular substances.** *Proc. Nutrition Soc.*, 1953, **12**, 247-255. [Child. Med. Centre, Boston, Mass.]

3133

BACCHUS, H. and HEIFFER, M. H. **Carbohydrate metabolism in ascorbic acid deficiency.** *Amer. J. Physiol.*, 1954, **176**, 262-266. [Dept. Physiol., Sch. Med., George Washington Univ., Washington, D.C.]

In guineapigs given a scorbutogenic diet or the same diet with green food, but with the intake regulated to that of those without green food, insulin tolerance tests and glucose-insulin tolerance tests showed that a progressive resistance to the action of insulin on blood sugar accompanied ascorbic acid deficiency. Similar tests with adrenalectomised animals on a scorbutogenic diet gave similar results. It is concluded that the disturbance of carbohydrate metabolism occurring in ascorbic acid deficiency is probably not due to diminished insulin secretion or to adrenal hyperactivity.—W. Godden.

3134

ALLEGRETTI, N. **Pancreatic islet cells and ascorbic acid in guinea pigs.** *Internat. Ztschr. Vitaminforsch.*, 1954, **25**, 125-135. [Inst. Physiol., Fac. Med., Univ. Zagreb, Yugoslavia.] German and French summaries.

Groups of guineapigs were fed on a diet of autoclaved beet, free from vitamin C, to which were added amounts of ascorbic acid ranging from 0.125 to 2.0 mg. daily. Three criteria were used to assess the degree of scurvy, namely, bodyweight change, tooth protection and ratio of beta to alpha cells in the islets of Langerhans. It was shown mathematically that the curves obtained were parallel but that the most precise measure of intake was obtained from the ratio of beta to alpha cells.—W. Godden.

3135

DARBY, W. J., MCGANITY, W. J., STOCKELL, A. and WOODRUFF, C. W. **Ascorbic acid, pteroylglutamates, and other factors in scorbutic hydroxyphenyluria.** *Proc. Nutrition Soc.*, 1953, **12**, 329-335. [Div. Nutrit., Sch. Med., Vanderbilt Univ., Nashville, Tenn.]

3136

CONSUELO MENDOZA C., A. **Influencia del ácido ascórbico sobre el colesterol sanguíneo. [Effect of ascorbic acid on blood cholesterol.]** *An. Fac. Farm. Bioquím., Lima*, 1952, **3**, 232-243. [Lab. Bioquím. Esp., Univ. Lima.]

Cholesterol was estimated by the method of Schefftel (*J. Lab. Clin. Med.*, 1944, **29**, 875) in the blood of 16 rabbits before and after injection of from 20 to 70 mg. ascorbic acid per kg. bodyweight. In normal rabbits the initial blood cholesterol values ranged from 30 to 60 mg. per cent. and an increase occurred in the first or second hour after injection of ascorbic acid. An initial high blood cholesterol value in rabbits with dermatitis of the ears or face was reduced after injection of ascorbic acid. High blood cholesterol values were found also in pregnant rabbits.—A. M. Copping.

3137

IMAZUMI, R. and YOSHIDA, H. **Interrelation between adrenaline, ascorbic acid and amino acid.** 1. Interpretation between adrenaline and ascorbic acid, and also between adrenaline and amino acid; especially studies on adrenaline sensibilization by amino acid and ascorbic acid, and on the mechanism of adrenaline action.

IMAZUMI, R., YOSHIDA, H., SATO, H. and NODA, T. 2. Relationship between ascorbic acid and amino acid. *Med. J. Osaka Univ.*, 1953, **4**, 115-126; 127-134. [Dept. Pharmacol., Med. Sch., Univ. Osaka.]

1. From spectroscopic measurements of mixtures of adrenaline quinone with ascorbic acid, and from blood pressure tests for adrenaline in healthy adult rabbits, it was concluded that the adrenaline quinone was reduced to adrenaline in presence of ascorbic acid and that the ascorbic acid was oxidised in the process.

In similar experiments with glycine instead of ascorbic acid, the adrenaline quinone was reduced to adrenaline and there was oxidative deamination of the glycine.

2. By estimation of oxygen consumption, and with chemical and spectrophotometric methods, it appeared that the auto-oxidation of ascorbic acid was inhibited by glycine in acid solution and promoted in alkaline. Glycine was deaminated by ascorbic acid and more strongly by dehydro-ascorbic acid, which was at the same time reduced.

E. M. Hume.

3138

FORNABOLLI, P. and AMATI, A. Azioni dell' ATP sul contenuto in acido ascorbico del surrene in ratti integri. [Effects of adenosinetriphosphate on the ascorbic acid content of the adrenal gland in intact rats.]

KOLLER, M. and AMATI, A. Azione dell' ATP sul contenuto in acido ascorbico del surrene di ratti ipofisectomizzati. [Effect of adenosinetriphosphate on the ascorbic acid content of the adrenal gland in hypophysectomised rats.] *Boll. Soc. ital. Biol. sper.*, 1953, **29**,

543-544; 544-546. [Lab. Ricerche Vister, Casatenovo, Como.]

In normal rats injection of adenosinetriphosphate in graded doses reduced the ascorbic acid content of the adrenal glands.

In hypophysectomised rats the effect was the same with the smaller doses of adenosinetriphosphate, but with the highest, 20 mg. given intraperitoneally or 1 mg. given intravenously, there was no reduction. It is suggested that the large dose promoted synthesis of ascorbic acid and thereby masked the simultaneous fall.

E. M. Hume.

3139

CALÌ, V. Influenza dell'iperpressione atmosferica sul contenuto di alcuni organi in acido ascorbico. [Influence of high atmospheric pressure on the ascorbic acid content of certain organs.] *Boll. Soc. ital. Biol. sper.*, 1953, **29**, 753-755. [Ist. Patol., Univ. Palermo.]

Twenty-nine guineapigs weighing from 350 to 450 g. were maintained on a standard diet. Four groups of 6 were exposed for from 1 to 3 hr. to an excess pressure of 1 atmosphere; one group had a single exposure, and the others were exposed daily on 10, 20 or 30 days. One group of 5 animals was untreated. The mean values for ascorbic acid, estimated by the method of Martini and Bonsignore (*Abst.* 2197, Vol. 4), in the adrenal glands, liver, and kidneys were somewhat high, the increase being progressively less as the number of daily exposures to the stress increased.

E. M. Hume.

3140

GERSCHMAN, R. and FENN, W. O. Ascorbic acid content of adrenal glands of rat in oxygen poisoning. *Amer. J. Physiol.*, 1954, **176**, 6-8. [Dept. Physiol., Sch. Med. Dent., Univ. Rochester, N.Y.]

3141

PIRTKIEN, R. and STEEGE, H. Morphologische Veränderungen an den Nebennieren von Meerschweinchen und Ratten unter Thiosemicarbazone-Behandlung. 3. [Morphological changes in the adrenal glands of guineapigs and rats treated with thiosemicarbazone. 3.]

ARZT, G., PIRTKIEN, R. and STEEGE, H. Wirkungen der Tuberkulostatika auf die Nebennierenrinden von Meerschweinchen und Ratten. [Effects of tuberculostatics on the adrenal cortex of guineapigs and rats.] *Ztschr. ges. exp. Med.*, 1953, **122**, 270-284; 285-294. [2. Med. Klin., Univ. Hamburg., Eppendorf.]

3142

MILKOVIĆ, S. Influence of vitamin C on preputial glands and thymus in intact and castrated-

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adrenalectomised rats. *Arch. internat. Physiol.*, 1954, **62**, 1-5. [Med. Fac., Univ. Zagreb.]

Rats which had been castrated and had had their adrenal glands removed were given 50 mg. Na ascorbate in 4 daily doses at 5-hr. intervals and had a 0.5 per cent. solution of ascorbic acid in saline to drink; others received only saline. Corresponding groups of intact animals were treated similarly. The weight of the thymus glands in the adrenalectomised and castrated animals was significantly less in those given ascorbic acid than in those given saline only. Intact rats showed no difference. In none of the rats was there any significant effect of ascorbic acid on the weight of the preputial glands, expressed as mg. per 100 g. bodyweight.—W. Godden.

3143

OSTER, H. L., KRETCHMAR, A. L. and BETHELL, F. H. **Effect of whole body X-irradiation on ascorbic acid of rat tissues.** *Proc. Soc. Exp. Biol. Med.*, 1953, **84**, 470-473. [Atomic Energy Commission Biol. Effects Irradiation Lab., Univ. Michigan, Ann Arbor.]

The effect of exposing the whole body to X-rays was studied on 2 strains of rats. In the Long Evans strain exposure of the whole body to 710 r produced an immediate, significant decrease in the ascorbic acid content of the adrenal glands, muscle and blood and a less marked decrease in the thymus, liver and spleen (see Abst. 2559, Vol. 17). In rats of the Wistar strain exposure to 1000 r gave a decrease of ascorbic acid in the adrenal glands only; the content of the other organs tended to increase at first.—W. Godden.

3144

FUJIMAKI, S. and NIWAYAMA, G. **On the vitamin-C-content in tuberculous tissue of various animals.** *Acta med. biol.*, 1953, **1**, 137-141. [Dept. Pathol., Sch. Med., Niigata Univ.]

3145

MOURIQUAND, G. and EDEL, V. **Sur l'hypervitaminose C. [Vitamin C excess.]** *C.R. Soc. Biol.*, 1953, **147**, 1432-1434.

Experiments in which guineapigs on stock and scorbutogenic diets received in addition 250 mg. ascorbic acid daily confirmed the findings of

Neuweiler (Abst. 1566, Vol. 21) that males and non-pregnant females were not affected by such large amounts of ascorbic acid given orally or intravenously. Pregnant animals similarly treated gave birth to one or more stillborn young and became infertile.—W. Godden.

3146

VAN EEKELLEN, M. **The occurrence of vitamin C in foods.** *Proc. Nutrition Soc.*, 1953, **12**, 228-232. [Central Inst. Nutrit. Res. T.N.O., Utrecht.]

3147

BAMFORD, E. and FENTON, F. **Home-freezing vs. home-canning of peas. Palatability, ascorbic acid, total solids, and colour.** *J. Amer. Dietetic Assoc.*, 1953, **29**, 1221-1225. [New York State Coll. Home Econ., Cornell Univ., Ithaca.]

In palatability, quality, and ascorbic acid content, home-frozen peas were better than home-canned peas. In home freezing, preliminary steam blanching followed by partial vacuum cooling gave better results than water blanching. In home canning, cold-pack peas showed higher palatability and ascorbic acid retention than hot-pack peas. All the tests were made with one variety of peas.—W. Godden.

3148

HARDING, C. F. and DAVID, J. J. **The effect of certain mineral nutrients on the ascorbic acid content of leaf lettuce.** *Food Res.*, 1954, **19**, 138-145. [Macdonald Coll., McGill Univ., Que.]

Sand-culture experiments of factorial design were made with leaf lettuce during winter and spring in a greenhouse, the amounts of N, P and K supplied in the culture solution being varied one at a time. N was the only fertiliser element to produce a significant variation in the ascorbic acid content of the crop and this only in the winter experiment. In general the effect of increasing N and P was to increase the ascorbic acid content, but increase of K caused a decrease. The balance between the 3 fertiliser elements was as important as the amount of any one nutrient supplied.

W. Godden.

See also Absts. 2981, 3503.

4. PHYSIOLOGY OF NUTRITION

ENZYMES

3149

- KIERMEIER, F. and CODURO, E. Der Einfluss des Wassergehaltes auf Enzymreaktionen in wasserarmen Lebensmitteln. 1. [Effect of water content on enzyme reactions in foods of low water content. 1.] *Ztschr. Lebensmittel-Untersuch. Forsch.*, 1954, **98**, 119-129. [Deutsch. Forschungsanst. Lebensmittelchem., Munich.]
A review.

3150

- GLOCK, G. E. and McLEAN, P. Levels of enzymes of the direct oxidative pathway of carbohydrate metabolism in the mammary gland of the rat. *Biochem. biophys. Acta*, 1953, **12**, 590. [Courtauld Inst. Biochem., Middlesex Hosp., London, W.1.]

The activity of glucose-6-phosphate and 6-phosphogluconate dehydrogenases in cell-free extracts of mammary glands of rats increased rapidly from the end of pregnancy to the end of lactation and then fell very low in the involuting gland. Similar, though less pronounced, changes were previously reported by Folley and Greenbaum (Abst. 1927, Vol. 17) for arginase and alkaline phosphatase.—W. Godden.

3151

- HECK, W. and PELIKAHN, H. Über Magen-Proteinasen im Säuglings- und Kindesalter. [Stomach proteases in infants and children.] *Ztschr. Kinderheilk.*, 1953, **74**, 30-49. [Kinderklin., Univ. Göttingen.]

Pepsin, cathepsin and pH were estimated in the gastric juice of infants and children. In 72 healthy children the enzyme content per ml. gastric juice increased with age, the average values for cathepsin and pepsin, reckoned in μg . of tyrosine N, increasing from 10 in premature infants to 240 in schoolchildren, with a wide scatter within each age group. For infants with infectious or gastric disorders the values were lower than in healthy infants, but there was no simple relation between the clinical picture and the disturbance of enzyme production. Formation of pepsin seemed to be more sensitive to disturbing influences than that of cathepsin.

Practical measures suggested by these experiments are the administration of protein hydrolysates to premature infants in need of protein additional to that from human milk, and of commercial enzyme preparations to older infants with chronic gastric disorders.—M. B. Richards.

3152

- BUCHS, S. Über die Art der in der schwach sauren Zone wirksamen Protease des Magens und über ihr Vorkommen im Darminhalt. [Nature of the stomach protease active in the weakly acid zone, and its occurrence in intestinal contents.] *Gastroenterologia*, 1954, **81**, 44-50. [Kinderklin., Univ. Basle.] English and French summaries.

3153

- BUCHS, S. Gelatine und Casein als Substrate der "sauren" protease des Magendarmkanals. [Gelatine and casein as substrates for the "acid" protease of the gastro-intestinal canal.] *Biochem. Ztschr.*, 1953, **325**, 44-53. [Kinderklin., Univ. Basle.]

Curves for the proteolytic activity of gastric juice or of extracts of mucous membrane from different parts of the digestive tract, with edestin, casein or gelatine as substrate, generally show 2 peaks independent of the substrate, one in the strongly acid and the other in the weakly acid zone. They are interpreted as summation effects of pepsin and cathepsin.—W. Godden.

3154

- ALAIS, C., MOCQUOT, G., NITSCHMANN, H. and ZAHLER, P. Das Lab und seine Wirkung auf das Casein der Milch. 7. Über die Abspaltung von Nicht-Protein-Stickstoff (NPN) aus Casein durch Lab und ihre Beziehung zur Primärreaktion der Labgerinnung der Milch. [Rennet and its action on the casein of milk. 7. On the splitting of non-protein nitrogen (N.P.N.) from casein by rennet and its relation to the primary reaction of the rennet coagulation of milk.] *Helv. chim. Acta*, 1953, **36**, 1955-1968. [Theodor-Kocher Inst., Univ. Berne.] English summary.
See Title 1761, Vol. 23.

3155

- GUILBERT, P. W. and WOLMAN, I. J. The importance of trypsin in infancy and childhood. *Amer. J. Med. Sci.*, 1953, **226**, 688-707. [Child. Hosp., Philadelphia, Pa.]
A review with 167 references.

3156

- VIJAYARAGHAVAN, P. K. and NARASINGA RAO, B. S. Action of duck's egg white ovomucoid on
N.A. and B., July 1954

tryptic hydrolysis of casein *in vitro*. *Nature*, 1953, **172**, 1152-1153. [Nutrit. Res. Labs., Indian Counc. Med. Res., Coonoor, S. India.]

Total and essential amino-acids were estimated after digestion of casein by trypsin for 24 to 120 hr. with or without ovomucoid from duck's eggs. In its presence the release of amino-acids was inhibited; of individual acids, release of histidine, lysine, threonine and valine was most affected, that of isoleucine, leucine and tryptophan moderately and that of arginine, methionine, phenylalanine to no significant degree. A similar action *in vivo* may, it is suggested, account for the low nutritive value of duck's in comparison with hen's egg white (Dikshit and Patwardhan, *Current Sci.*, 1950, **19**, 18).—D. Harvey.

3157

DEL COURT, A. A propos de l'activité estérasiqne et lipasique du sérum sanguin et du suc pancréatique. [Esterase and lipase activity of blood serum and pancreatic juice.] *Acta gastro-enterol. belg.*, 1953, **16**, 703-710. [Dept. Med., Univ. Chicago.] English summary.

With Seligman's technique, no pancreatic lipase was found in the serum of normal subjects or of 3 patients with acute pancreatitis. In the study of pancreatic disorders the value of this technique is limited to examination of duodenal juice collected after stimulation of the pancreas. The serum of dogs had lipolytic activity comparable with the lipase activity of the pancreatic juice. This lipase activity persisted, without appreciable modification, several months after removal of the pancreas, indicating that the lipase activity in the serum of the normal dog is not solely of pancreatic origin. The results were confirmed by electrophoretic studies.—M. B. Richards.

3158

CACIOPPO, F., QUAGLIARIELLO, E., COLTORTI, M. and DELLA PIETRA, G. Fosfatasi alcalina e pH ottimo. [Alkaline phosphatase and optimum pH.] *Arch. Sci. biol., Bologna*, 1953, **37**, 563-573. [Ist. Chim., Fac. Med. Chirurg., Univ. Naples.]

In presence of Mg and with decreasing concentration of the substrate the optimum pH for alkaline phosphatase activity approached neutrality. With purified phosphatase in the absence of Mg and at substrate concentrations of 7.4, 14.8 and 37 μ g. per ml., the optimum pH was 9, but addition of

Mg shifted the optimum towards neutrality. With lower substrate concentrations of 5 and 3 μ g. per ml., even without addition of Mg, the optimum pH was lower, but addition of citrate caused a return to a more alkaline value. This probably indicated the presence of Mg in the enzyme extract, not completely removed in the process of purification. Such residual Mg might be sufficient to have an appreciable activity at low substrate concentrations.

It is considered that the shift of optimum pH of phosphatase activity towards neutrality when the substrate concentration is very low can be explained by the action of Mg^{++} on the enzyme.

M. B. Richards.

3159

FIŠER-HERMAN, M. and PERŠIČ, D. Prosječni nalazi alkalne fosfataze u serumu zdravih ljudi. [Average values for alkaline phosphatase in the serum of healthy human beings.] *Acta med. jugoslav.*, 1953, **7**, 261-264. [Inst. Clin. Chem., Fac. Pharm., Zagreb.] German summary.

Alkaline phosphatase was estimated in the blood serum of 105 healthy adults. The results expressed in Bodansky units and in King Armstrong units corresponded with those in the literature.

For a group of girls from 7 to 14 years old in a children's home some very high values were obtained; no clinical cause for these could be found. (From summary).—E. M. Hume.

3160

SUKUMARAN, M. and BLOOM, W. L. Influence of diet on serum alkaline phosphatase in rats and men. *Proc. Soc. Exp. Biol. Med.*, 1953, **84**, 631-634. [Dept. Med., Emory Univ., Ga.]

In young rats weighing about 175 g. the serum alkaline phosphatase after adrenal removal was somewhat higher than in normal adult rats. In both groups serum alkaline phosphatase was decreased by fasting for 24 hr. In fasted normal rats feeding with glucose or egg albumin did not restore phosphatase activity, but fat restored it almost to normal.

In hospital patients without liver or bone disorders serum alkaline phosphatase activity was much lower than in rats, but was also reduced by fasting for 20 hr. and restored by a high-fat meal, though not by carbohydrate or protein.

D. Duncan.

See also Absts. 2953, 2976, 3302, 3333, 3531.

DIGESTION AND ABSORPTION

3161

ERICSSON, Y. **Investigations on the occurrence and significance of citric acid in the saliva.** *J. Dent. Res.*, 1953, **32**, 850-858. [Nat. Inst. Dent. Res., Bethesda, Md.]

3162

ÖBRINK, K. J. **The mode of action of food as a gastric stimulant. A study with some quaternary ammonium derivatives.** *Acta physiol. scand.*, 1954, **30**, 282-288. [Inst. Physiol., Univ. Upsala.]

The effects were studied of 2 quaternary ammonium bases, Banthine and Vegolysin, on the secretion of gastric juice by Heidenhain pouches in dogs.

Neither substance inhibited secretion induced by injection of histamine. Banthine inhibited secretion after feeding. Vegolysin, but not Banthine, prevented secretion after injection of insulin.

These results indicate that Banthine inhibits food-induced secretion at some point before the release of histamine; therefore food does not produce secretion directly by liberating histamine. The failure of Vegolysin to prevent secretion after food means that neither the vagus nor synaptic transmission is concerned in producing a stimulating substance, and suggests that secretion after feeding is effected by the local nerve plexi of the stomach.—A. T. Phillipson.

3163

ÖBRINK, K. J. **Bonedust-meat mixture as a test meal for continuous gastric secretion.** *Acta physiol. scand.*, 1954, **30**, 275-281. [Inst. Physiol., Univ. Upsala.]

Bonedust, mixed with forcemeat almost free of fat and carbohydrates but containing 9 per cent. protein and protein derivatives and small amounts of keratin and fluorine, produced a greater increase in the quantity of gastric juice secreted by Heidenhain pouches in dogs than that produced by forcemeat alone. Most of the effect from the bonedust could be obtained from equivalent quantities of Ca triphosphate. Ca lactate, sodium triphosphate and Ca citrate produced little secretion, but sodium glycerophosphate, in which phosphate is attached to the glycerine molecule, had a marked effect.

It is concluded that the stimulating property of bonedust lies in its trivalent monohydrogen phosphate content.—A. T. Phillipson.

3164

AITKEN, M. A., SPRAY, G. H. and WALTERS, G. **Gastric pepsin and the excretion of uropepsinogen in anaemia.** *Clin. Sci.*, 1954, **13**, 119-126. [Nuffield Dept. Clin. Med., Oxford.]

In normal subjects and patients suffering from different types of anaemia, steatorrhoea or the results of total gastrectomy there was a linear relation between the concentration of HCl and of pepsin in the gastric juice after histamine and between the concentration of pepsin in the gastric juice and the amount of uropepsinogen excreted in the urine. In subjects with histamine-fast achlorhydria both gastric pepsin and uropepsinogen were reduced or absent.

The value of uropepsinogen estimation as a preliminary test for gastric secretory activity is discussed.—L. Wills.

3165

WOLF, S., RUSSELL, L., KARNES, J. and CAPUTTO, R. **Protein patterns in human gastric juice as identified by the ultracentrifuge.** *J. Lab. Clin. Med.*, 1953, **42**, 969-970. *Proc.* [Oklahoma City, Okla.]

3166

CORSI, V. and SANGIORGI, M. **Ricerche sulla composizione elettrolitica del succo gastrico umano. 1. Sul contenuto di elettroliti del succo gastrico a digiuno. [Studies on the electrolytic composition of human gastric juice.] 1. The electrolyte content of fasting gastric juice.** *Arch. ital. Malat. Appar. diger.*, 1953, **19**, 409-428. [Ist. Clin. Med. Terap., Univ. Catania.]

One hundred samples of human gastric juice obtained after a fast of at least 12 hr. were analysed.

The only important inorganic anion is Cl, which is present partly as HCl and partly as neutral Cl, either as basic Cl in combination with Na, K or Ca, or as a small organic fraction or Cl residue. The samples of gastric juice were divided into 4 groups according to their acidity, ranging from those with no free HCl to those with more than 1.5 per cent. As the amount of free HCl increased, the concentration of basic Cl in the form of NaCl fell. The concentration of KCl remained almost constant and that of CaCl₂, which was present in small amounts, showed slight variations. The concentration of total Cl was relatively constant.

M. B. Richards.

3167

LINDENSCHMIDT, T. O. **Der Ablauf der Proteolyse nach partieller und totaler Magenresektion. [The course of proteolysis after partial and total resection of the stomach.]** *Verhandl. deutsch. Gesellsch. Chirurg., Munich*, 7-11 April 1953;

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Langenbecks Arch. klin. Chirurg., 1953, **276**, 636-639. [Hamburg.]

3168

MORRIS, M. L. **Some physiological considerations in rumen digestion.** *Vet. Med.*, 1954, **49**, 21-22. [Topeka, Kans.]

3169

WIERINGA, G. W. De betekenis van de pensflora voor de spijsvertering van herkauwers. [Importance of rumen flora for digestion in ruminants.] *Tijdschr. Diergeneesk.*, 1954, **79**, 99-105. [Lab. Rijksseruminrichting.] English, French and German summaries.

A review.

3170

JOHNS, A. T. **Fermentation of glycerol in the rumen of sheep.** *N.Z. J. Sci. Technol.* [A], 1953, **35**, 262-269. [Grasslands Div., D.S.I.R., Palmerston North.]

The fermentation of glucose and glycerol in the rumen and in rumen contents *in vitro* were compared. Glucose was fermented rapidly and gave rise to acetic, propionic and butyric acids; glycerol gave rise to propionic acid only.

The use of glucose and glycerol in treating the clinical conditions characterised by ketosis is discussed.—A. T. Phillipson.

3171

MCDONALD, I. W. **The extent of conversion of food protein to microbial protein in the rumen of the sheep.** *Biochem. J.*, 1954, **56**, 120-125. [Agric. Res. Coun., Inst. Animal Physiol., Babraham Hall, Cambridge.]

Sheep with duodenal cannulae were fed on a ration in which 94 per cent. of the total N was contributed by zein. Abomasal contents were collected as they passed to the duodenum and the lysine content of the feed, the rumen micro-organisms and the abomasal contents was estimated. It is calculated that about 40 per cent. of the zein was utilised by rumen micro-organisms for synthesis of their own protein.

A. T. Phillipson.

3172

KAMBOKA, K., MORIMOTO, H., TAKAHASHI, S. and KUBOTA, D. [Studies on the digestion of ruminants. 1. On the change of nitrogen distribution and pH in the rumen content.] *Bull. Nat. Inst. Agric. Sci., Chiba, Japan* [G], 1953, No. 7, 169-174. In Japanese: English summary.

Two goats with rumen fistulae were fed on high-, medium- and low-protein diets and on a low-protein diet supplemented with urea. Samples

of rumen contents were examined at intervals for 24 hr. N content decreased with time, most rapidly after the high-protein diet. Bacterial and protozoal N together accounted for about half the total N in the rumen. Except for the sample taken 24 hr. after food, which showed a high pH, the pH of the rumen was from 5.4 to 6.6; the lowest value was obtained 4 hr. after food. (From summary.)—W. Godden.

3173

DAVIDSON, J. **A comparative study of the pigments in microbial fractions from the sheep's rumen and in the corresponding diet.** *J. Sci. Food Agric.*, 1954, **5**, 86-92. [Rowett Res. Inst., Bucksburn, Aberdeenshire.]

Samples of rumen contents obtained by fistula from a sheep fed on chopped meadow hay were fractionated, after filtering through surgical gauze, by centrifuging at 500, 8000 and again at 8000 g. after adjusting the pH to 4, and the pigments were estimated in the fractions.

The pigmentation of the microbial fractions was caused by pigments usually associated with plant chloroplasts. Assessment of plant particle contamination of the microbial fractions from the amounts of the pigments present agreed in general with that obtained by a new direct count on a microscope slide. It was of the order of 10 per cent. Degradation of chlorophylls in the rumen was demonstrated and its extent was found to depend on the nature of the vegetable material in the diet.—W. Godden.

3174

MOIR, R. J., SOMERS, M., SHARMAN, G. and WARING, H. **Ruminant-like digestion in a marsupial.** *Nature*, 1954, **173**, 269-270. [Inst. Agric., Dept. Zool., Univ. W. Australia, Nedlands.]

The kangaroo is a true herbivore, and consequently can be expected to digest cellulose, and its alimentary morphology suggests that it is closer to the ruminant than to animals in which the large intestine is enlarged. The experiments reported were performed on *Setonix brachyurus*. Dissection showed that the stomach was sacculated in the upper regions and possessed a well-defined oesophageal groove. Microscopical examination of the stomach contents showed a rich microbial population similar to, but simpler than, that of the sheep's rumen. Microbial erosion of plant fragments was seen, and steam-volatile fatty acids, from 2 to 15 m.mol. per 100 ml., were present in the stomach contents. These acids were mostly absorbed by the time the digesta reached the fundus of the stomach. More volatile fatty acids were present in blood leaving the stomach and caecum than in peripheral blood. These acids were removed by the liver and tissues. The blood

sugar was low and, like the sheep, *Setonix* tolerated insulin hypoglycaemia well.

Setonix, in fact, is closely similar to the sheep in these respects. The similarity is interesting from an evolutionary point of view, as the marsupials and Eutheria are held to have been separate since the Cretaceous period.

Setonix weighs 2 to 3 kg. and promises to be a cheap laboratory animal in which metabolic problems similar to those of ruminants may be studied.—A. T. Phillipson.

3175

BAKEEVA, E. N. and UTEKHIN, B. P. Usilenie pishchevareniya u svinei. [Intensifying the digestion of pigs.] *Sovet. Zootech.*, 1952, No. 11, 62-67. [Nauch. Issled Inst. Svinovodstva.]

Coarse and succulent fodder given in large amounts in a pig's ration intensify digestive processes by mechanical stimulation of the mucous glands of stomach and intestine and increase of digestive secretions. (From author's summary.)

W. Hughes.

3176

ANNEGERS, J. H. Function of pancreatic juice and of bile in assimilation of dietary triglyceride. A review. *Arch. Int. Med.*, 1954, 93, 9-22. [Dept. Physiol., Northwestern Univ. Med. Sch., Chicago, Ill.]

3177

PONZ, F. Inhibición de la absorción intestinal de glucosa por el ión cúprico. [Inhibition by the cupric ion of absorption of glucose from the intestine.] *Rev. española Fisiol.*, 1953, 9, 205-211. [Lab. Fisiol. Animal, Fac. Cien., Univ. Barcelona.] English summary.

The effect of the cupric ion on the intestinal absorption of glucose by the rat was studied by the Sols and Ponz technique with 4 successive absorptions, each of 30 min. A 5.4 per cent. solution of glucose was used, and CuSO_4 in different concentrations was present in the second and fourth absorptions of each series. From concentrations of 0.0001 *M* upwards, Cu^{++} inhibited absorption of glucose. With a concentration of 0.0002 *M* the inhibition was 10 to 30 per cent. in the first absorption, and about twice as great in the second absorption with Cu. With a concentration of 0.005 *M* inhibition was 40 to 80 and 80 to 100 per cent. with Cu. After Cu absorption thorough washing of the loop did not remove the inhibiting effect, which persisted in the next test with glucose alone. The inhibitory effect of Cu^{++} on the glucose absorption must be due to a local effect on the absorbent epithelium, and not to a general toxic effect, for the presence of Cu in a different intestinal loop, even in concentrations of 0.001 *M*, had no effect on the absorption of glucose

in the other loop. Inhibition is attributed to the fixation of Cu^{++} by ionic or —SH groups of the proteins of the mucosa.—M. B. Richards.

3178

MATTHEWS, D. M. and SMYTH, D. H. The effect of temperature on the rate of transference of D-L-alanine through the intestinal wall. *J. Physiol.*, 1953, 122, 76P-77P. [Dept. Physiol., Univ. Sheffield.]

3179

BYERS, S. O., FRIEDMAN, M. and GUNNING, B. Observations concerning the production and excretion of cholesterol in mammals. 11. The intestinal site of absorption and excretion of cholesterol. *Amer. J. Physiol.*, 1953, 175, 375-379. [Harold Brunn Inst., Mount Zion Hosp., San Francisco, Calif.]

The large intestines were removed from a group of rats, which were then given 3 ml. olive oil by stomach tube. After 72 hr. total stomach and intestinal contents were taken for estimation of total sterols, cholesterol and non-cholesterol sterols. The control group were treated similarly, but the faeces were pooled with the gut contents for analysis. The animals without large intestines excreted as much cholesterol and almost as much total sterol as did the intact rats, and it is suggested that the small intestine is the chief site of cholesterol excretion.

The absorption of endogenous cholesterol was studied by giving olive oil to rats and then removing their colons and collecting lymph from the thoracic ducts for 24 hr. Control animals had also thoracic duct cannulae. Lymph from the rats without colons contained only about half as much cholesterol as lymph from the controls, but the loss of a large part of the intestinal vascular bed may account for much of the difference.

The role of the small and large intestines in the absorption of exogenous cholesterol was studied in several ways. Cholesterol dissolved in olive oil was given by mouth to rats (1) with their large intestines removed and with thoracic duct cannulae, (2) with intact large intestines, but with diversion of the bile either to the ascending colon or to the stomach, or (3) with small portions of their large intestines removed 3, 6, 12 and 24 hr. after the cholesterol was given. These experiments showed that the cholesterol given by mouth was absorbed exclusively by the small intestine and that bile was necessary for absorption.

Rats with ligatures about the middle of their small intestines were given, either by mouth or into the distal portion of the small intestine at a point below the ligature, cholesterol dissolved in olive oil; cholesterol was estimated in thoracic lymph. These studies showed that the distal half of the

small intestine was the only portion capable of absorbing exogenous cholesterol.—G. A. Garton.

3180

MORROW, P. E., SMITH, F. A., CASARETT, L. J., DELLA ROSA, R. J. and STANNARD, J. N.

Absorption of polonium from the gastrointestinal tract of the cat. *J. Pharmacol. Exp. Therap.*, 1954, **110**, 40. *Proc. [Div. Pharmacol., Sch. Med. Dent., Univ. Rochester, N.Y.]*

See also Abst. 3069, 3365, 3408-10.

COMPOSITION OF BODY FLUIDS AND TISSUES

BLOOD

3181

GREGGERSEN, M. I. **Effect of circulatory states on determinations of blood volume.** *Amer. J. Med.*, 1953, **15**, 785-789. [Dept. Physiol., Coll. Phys. Surg., Columbia Univ., New York.]

3182

TERZIOĞLU, M. and TUNA, N. **Variations in blood volume at 1.85 km altitude.** *J. Appl. Physiol.*, 1954, **6**, 417-422. [Inst. Physiol., Univ. Istanbul.]

3183

ARTHURTON, M., O'BRIEN, D. and MANN, T. **Haemoglobin levels in premature infants.** *Arch. Dis. Childhood*, 1954, **29**, 38-43. [Inst. Obstet., Hammersmith Hosp., London.]

3184

BURGIO, G. R. and LO JACONO, F. Sulla sideremia e transferrina nell' infanzia in condizioni di salute e di malattia. [Blood iron and transferrin in infancy in health and disease.] *Boll. Soc. ital. Biol. sper.*, 1953, **29**, 692-695. [Clin. Pediat., Univ. Palermo.]

3185

WADSWORTH, G. R. **Haemoglobin levels of people living in the tropics.** *J. Physiol.*, 1953, **45**, 10P. [Dept. Physiol., Univ. Malaya, Singapore.]

3186

MOHAN SINGH, M., KAPOOR, S. P. and SINGH, G. **Normal haematological values in young Punjabi females.** *Indian Med. Gaz.*, 1953, **88**, 316-321. [Dept. Pathol., Med. Coll., Amritsar.]

Blood samples from 100 healthy women aged from 17 to 24 years, medical students and nurses from upper middle-class Punjabi families, gave the following mean values: Hb 13.09 ± 0.86 g. per 100 ml., total red cell count $4.55 \pm 0.04 \times 10^6$ per c.mm., packed cell volume 41.6 ± 2.7 per cent., mean corpuscular volume 92.23 ± 5.04 c. μ ., mean corpuscular Hb 29.04 ± 1.78 μ g., mean corpuscular Hb concentration 31.47 ± 0.51 per cent., total white cell count 7358, range 4000 to 10,700 per

c.mm. For serum proteins the means for 59 of the subjects were: total 7.20 ± 0.26 , albumin 5.05 ± 0.26 , globulin 2.19 ± 0.21 g. per 100 ml. For serum Ca the mean for 46 of the subjects was 10.75 ± 0.44 mg. per cent. Comparison with values quoted from the literature showed that the haematological values, though below those of other countries, were mostly higher than those from other parts of India.

The average diets were: medical students, milk $\frac{1}{4}$ to $\frac{1}{2}$ seer, chapattis 5 or 6, made from 3 chhataks wheat, vegetables $\frac{1}{4}$ seer, dhal $\frac{1}{2}$ chhatak, curd 2 chhataks, with moderate quantities of fruits in season, and tea, daily, 1 egg on alternate days and 2 oz. meat twice a week (cheese for vegetarians); nurses, milk $\frac{1}{4}$ seer, chapattis 4 or 5, made from 2 $\frac{1}{2}$ chhataks wheat, vegetables $\frac{1}{4}$ seer, dhal $\frac{1}{2}$ chhatak, meat 1 chhatak (1 oz. butter for vegetarians), small quantities of fruit, and tea, daily, with 1 egg on alternate days. [1 seer is about 2 lb., and 1 chhatak, 2 oz.]—W. M. Deans.

3187

GOLDECK, H., REMY, D. and LABHARD, H. Eisenmangel und Schwangerschaft. [Iron deficiency and pregnancy.] *Deutsch. med. Wochenschr.*, 1954, **79**, 211-213. [2. Med. Klin., Univ. Hamburg, Eppendorf.]

Of 100 apparently normal pregnant women, mostly in the second half of pregnancy, 61 had Hb above 11 g. and serum Fe above 90 μ g. per 100 ml., values assumed to be the lower limits of normal; 5 had Hb between 10 and 11 and normal serum Fe; 12 had both low Hb and low serum Fe; and 22 had normal Hb but low serum Fe, and were considered to be in latent Fe deficiency. Serum Fe fell with increasing parity. Of the 61 in group 1, 18 were given 204 mg. Fe by mouth; serum Fe rose rapidly in all these and it is considered that they too were deficient in Fe. The 5 in group 2, on the other hand, showed the "pseudo-anaemia" due to the increased plasma volume. The conclusion is that Fe treatment during pregnancy is justifiable in a higher proportion of cases than is generally supposed.—W. M. Deans.

3188

GERRITSEN, T. and WALKER, A. R. P. **The effect of habitually high iron intake on certain blood**

values in pregnant Bantu women. *J. Clin. Invest.*, 1954, **33**, 23-26. [S. African Inst. Med. Res., Johannesburg.]

Estimations of Hb, haematocrit value, serum Fe and Fe-binding capacity were made for 48 non-pregnant and for 92 pregnant Bantu women, of whom 43 were less than 22 weeks and 49 were between 26 and 40 weeks pregnant. Analyses of samples of cooked or sour porridge and beer showed that their intake from these sources alone might be from 23 to 202 mg. Fe, mean 171 mg., daily. Contrary to expectation, Hb and haematocrit values did not fall in the second half of pregnancy. Data are not available for individual subjects throughout pregnancy, but it is thought that the high Fe intake may allow a quantitative increase in total Hb and total red cells which masks in the Bantu the fall considered physiological in white pregnant women.

In harmony with other reports, the total Fe-binding capacity was higher during the second than during the first half of pregnancy.

D. Harvey.

3189

HOLMES, E. G. Examination of the red-blood counts, haemoglobin, packed cell volume, serum iron and iron continuing [combining] capacity of the blood and serum of a small series of pregnant women at Mulago Hospital. *East African Med. J.*, 1953, **30**, 427-429. [Dept. Physiol., Makerere Coll.]

In 45 unselected pregnant African women of whom 16 were anaemic, blood examinations showed the usual fall in Hb, red blood cells and packed cell volume in the later months though the mean corpuscular volume, mean corpuscular Hb and mean corpuscular Hb concentration were within normal limits. As pregnancy proceeded the combined Fe in the serum decreased and the Fe-binding capacity increased.—L. Wills.

3190

RUSOFF, L. L., JOHNSTON, J. E. and BRANTON, C. Blood studies of breeding dairy bulls. 1. Haematocrit, hemoglobin, plasma calcium, plasma inorganic phosphorus, alkaline phosphatase values, erythrocyte count, and leucocyte count. *J. Dairy Sci.*, 1954, **37**, 30-36. [Dairy Dept., Louisiana Agric. Exp. Stat., Baton Rouge.]

Blood samples were obtained on 3 consecutive days each month for 1 year from 5 Jersey, 5 Guernsey and 5 Holstein breeding bulls under semi-tropical conditions. Each bull was housed alone and had access to 0.9 acre pasture. A grain ration was given at the rate of $\frac{1}{2}$ lb. per 100 lb. liveweight, and grass hay was given during periods of poor pasture.

Significant breed differences were found for packed red cell volume, alkaline phosphatase value and leucocyte count. Packed red cell volume, Hb value and leucocyte count rose and plasma alkaline phosphatase fell when the environmental temperature rose above 80° F.—J. N. Aitken.

3191

LAURELL, C. B. Isolation and properties of crystalline Fe-transferrin from pig's plasma. *Acta chem. scand.*, 1953, **7**, 1407-1412. [Lab. Clin. Chem., Univ. Lund.]

Techniques of preparation, purification and crystallisation are described. The product contained 16.3 g. N, 1.4 g. carbohydrate and between 0.120 and 0.136, mean 0.126, g. Fe per 100 g.; it was practically free from lipids. Its purity after recrystallisation was found to be measured better by the change which occurred in the ratio between absorption at 470 m μ . and 408 m μ . than by electrophoretic analysis.—D. Harvey.

3192

JELLIFFE, D. B. Serum proteins in the newborn African. *Doc. med. geogr.*, 1953, **5**, 286-288. [Univ. Coll. West Indies, Jamaica.]

The serum proteins were estimated in cord blood from 34 apparently full-term African babies, the children by normal delivery of normal women who were having a low-protein diet. The mean figures in g. per 100 ml. were for total protein 5.82 with range 4.80 to 7.30, albumin 3.84 with range 2.50 to 4.30, and globulin 2.15 with range 1.55 to 3.90. The figures are within the range reported for newborn Caucasian infants.—L. Wills.

3193

TOMAN, M. and KAZDOVÁ, D. Vliv jednotlivých druhů kojenecké potravy a bílkovinných přísadků na hladinu bílkovin v krvi nedonošenců. [The influence of foods and protein supplements upon the blood protein level in premature infants.] *Lékařské listy*, 1954, **9**, 42-44. [Pediat. Clin., Med. Fac., Masaryk Univ., Brno.] English, French and Russian summaries.

In 164 premature infants the blood protein level was estimated immediately after birth and subsequently before and after changes in diet or addition of protein hydrolysates. No significant increase of blood protein occurred. Sudden increase of the protein content of the diet produced a slight temporary rise in blood protein, but it fell in a short time to the initial level.

A. Jančařík (Czechoslovakia).

3194

PAEZ PUMAR, H., E. Algunos aspectos de la protemia en embarazadas de la clase obrera de

N.A. and R., July 1954

Caracas. [Blood protein in pregnant women of the working class in Caracas.] *Arch. venezol. Nutricion*, 1952, **3**, 299-307. [Inst. Nac. Nutrición.] English and German summaries.

Of 250 pregnant women 61.13 per cent. had total serum protein values of less than 6 per cent. The average was 5.87, with extremes of 7.88 and 4.05. The average values for albumin and globulin were 3.28 and 2.58 per cent., and the albumin : globulin ratio was 1.30. No significant difference could be attributed to the month of pregnancy or to the presence of oedema, which occurred in 44.13 per cent. No relation was found between total protein and the values for red corpuscles and Hb. A number of the women received for from 1 to 3 months free meals which supplied more than 40 per cent. of the daily requirement for most of the nutrients, but no significant change in the blood protein occurred.—M. B. Richards.

3195

HOCH-LIGETI, C., IRVINE, K. and SPRINKLE, E. P. Investigation of serum protein patterns in patients undergoing operation. *Proc. Soc. Exp. Biol. Med.*, 1953, **84**, 707-710. [Dept. Pathol., Sch. Med., Univ. Virginia, Charlottesville.]

3196

TARANOV, M. T. Azotistyi profil' i aminokislотноyi sostav syvorotki krovi zhereby ot raznogo vozrasta. [Nitrogen and amino-acid content of the blood serum of foals of different ages.] *Konevodstvo*, 1953, No. 10, 9-14. [Kaf. Biol. Khim., Mosk. Zootech. Inst. Konevodstva.]

The effect of weaning time on the blood serum of foals was investigated. Foals were weaned at 3, 5, 6 and 7 months. Total N, protein N, N.P.N. and amino-N, and tyrosine, phenylalanine, tryptophan, glycine, arginine, cysteine and methionine were estimated in the blood serum before and 1 month after weaning. Weaning affected the protein composition of the blood both quantitatively and qualitatively. The N compounds in the blood of 3-, 5- and 7-month-old unweaned foals differed to a greater extent from those of weaned foals than those of 6-month-old weaned and unweaned foals from each other.—W. Hughes.

3197

STÖCKL, W. and ZACHERL, M. K. Papierelektrophoretische Untersuchungen des Serums von Rind und Pferd. [Paper electrophoresis of the serum of cattle and horses.] *Hoppe-Seyler's Ztschr.*, 1953, **293**, 278-283. [Bundesanst. Tierseuchenbekämpfung, Mödling, Vienna.]

Studies of the protein fractions in the serum of cattle and horses show considerable variations between individual normal animals, although the values for any one animal may remain fairly

constant over 3 to 4 weeks. Average values are meaningless. After injection of an aluminium adsorbate vaccine there was a rise in the γ -globulin fraction, considered to be due to increased antibody formation.—W. Godden.

3198

BRADISH, C. J., HENDERSON, W. M. and BROOKSBY, J. B. Electrophoretic studies of ox serum. 1. The sera of normal cattle. *Biochem. J.*, 1954, **56**, 329-335. [Res. Inst. (Animal Virus Dis.), Pirbright, Surrey.]

3199

McKINLEY, W. P., OLIVER, W. F., MAW, W. A. and COMMON, R. H. Filter paper electrophoresis of serum proteins of the domestic fowl. *Proc. Soc. Exp. Biol. Med.*, 1953, **84**, 346-351. [Fac. Agric., McGill Univ., Macdonald Coll., Que.]

See Abst. 29, Vol. 24.

An albumin fraction associated with a lipid and 5 globulin fractions were found in sera of sexually immature pullets. A double zone thought to be phosphoprotein was seen in sera of laying hens and a similar double zone in egg yolk; a phospholipin was partly associated with this phosphoprotein.

C. Warner.

3200

CAREDDU, P. Variazioni protidemiche da carico lipidico. [Changes in blood proteins after a load test with lipid substances.] *Boll. Soc. ital. Biol. sper.*, 1953, **29**, 1258-1261. [Clin. Pediat., Univ. Sassari.]

The behaviour was investigated of the proteins of rat serum when subjected to electrophoresis on paper before and 12 hr. after parenteral administration of different substances. When cholesterol was given there was decrease of albumin and increase of β -globulin. After phospholipins the effect was the same, though the increase in β -globulin was somewhat less. After neutral fat or fatty acids there was no change.—E. M. Hume.

3201

FISCHER, M. A. and GARRITY, G. C. Protein metabolism in the choline-deficient rat. 2. Effects of age and sex on serum proteins. *J. Biol. Chem.*, 1954, **206**, 345-352. [Dept. Biochem., Sch. Med., Univ. Pittsburgh, Pa.]

This paper extends the experiments described in Abst. 2036, Vol. 24. The effects described previously were found to be more marked in male than in female, and in younger than in older rats.

C. Warner.

3202

SPECTOR, W. G. Labelled glycine in the nephrotic syndrome. *Clin. Sci.*, 1954, **13**, 1-10. [Dept.

Morbid Anat., University Coll. Hosp. Med. Sch., London.]

Glycine labelled with ^{15}N was given by mouth to one healthy child and 3 with nephrosis. When the isotope concentrations in the plasma protein fractions were plotted against time, curves of characteristic shape were obtained for both albumin and globulins. The close similarity of the albumin curves from plasma and urine in the nephrotic children seemed to indicate that these proteins are formed at the same site. In severe nephrosis the plasma albumin curves differed from normal in that they reached a higher peak and had a steeper slope in both ascending and descending portions. The possible significance of the abnormal shape of these curves is discussed.

M. B. Richards.

3203

MOIR, T. W., FORD, A. B. and PRITCHARD, W. H. The study of the early disappearance of iodinated (I^{131}) serum albumin from the circulation of edematous subjects by a continuously recording method. *J. Lab. Clin. Med.*, 1953, 42, 925. *Proc.* [Cleveland, Ohio.]

3204

ROSSI-FANELLI, A., CAVALLINI, D. and MERUCCI, P. Amino acid composition of crystallised human myoglobin and haemoglobin. *Experientia*, 1954, 10, 72-73. [Inst. Biol. Chem., Univ. Rome.]

Chromatographic analysis of samples of human and horse myoglobin and oxidised Hb showed that myoglobin contained isoleucine but no cystine and Hb contained cystine but no isoleucine.

D. Harvey.

3205

WALKER, A. R. P., ARVIDSSON, U. B. and POLITZER, W. M. The significance of low serum calcium values in the South African Bantu. *S. African Med. J.*, 1954, 28, 48-51. [S. African Inst. Med. Res., Johannesburg.]

Estimations of serum Ca in boys, 23 aged from 7 to 12 and 54 from 14 to 15 years, 48 adult men and 33 non-pregnant, 38 pregnant and 55 lactating women confirmed reports by other workers that the level is about one-tenth lower in Bantu than in white subjects.

During pregnancy Bantu women differed from white women in showing an increase, not a decrease, in comparison with non-pregnant women of the same race, which conforms with the absence of reports of osteomalacia among pregnant Bantu women. There was no correlation between the Ca contents of blood and milk of the same mother, and paediatricians' impressions from the general health and growth of Bantu babies were that their mothers' milk could be no poorer than that of white mothers.

Mineralisation of bone appeared to be no less and the incidence of fractures no greater than in other populations, and the repair of fractures was no slower among Bantu than among Europeans. The incidence of dental decay was generally less in Bantu than in white subjects.—D. Harvey.

3206

GHOSE, C. Studies on metabolism of calcium, inorganic phosphorus and cholesterol in pre-eclamptic toxæmias of pregnancy. *Indian Med. Gaz.*, 1953, 88, 363-368. [Dept. Midwifery, Nilratan Sircar Med. Coll., Calcutta.]

In 32 women with pre-eclamptic toxæmia in the last trimester mean blood serum Ca was significantly lower and mean serum inorganic P and serum cholesterol ester were significantly higher than normal. The rise in free cholesterol was not significant.—F. C. Aitken.

3207

GHOSE, C. Studies on metabolism of calcium, inorganic phosphorus and cholesterol in pregnancy with helminthic infection in Indian women. *Indian Med. Gaz.*, 1953, 88, 440-447. [Dept. Midwifery, Nilratan Sircar Med. Coll., Calcutta.]

In 81 pregnant women with subclinical worm infestation and without clinical evidence of anaemia variations from normal in serum Ca, inorganic P and total cholesterol were not significant. Cholesterol ester values were significantly below normal.—F. C. Aitken.

3208

STURGEON, P. (with CHRISTIAN, E.) Studies of iron requirements in infants and children. 1. Normal values for serum iron, copper and free erythrocyte protoporphyrin. *Pediatrics*, 1954, 13, 107-125. [Child. Hosp., Los Angeles, Calif.] Spanish summary.

Specimens of blood were obtained from 237 infants and children; 24 were of cord blood, 48 were from infants aged 6 hr. to 12 days and 165 from children aged 2 weeks to 10 years. For comparison the blood of 34 men was studied.

Compared with the normal adult the newborn infant's serum Fe, serum Cu and free red cell protoporphyrin were high. At age 12 hr. serum Fe was low with little change in Cu and protoporphyrin. By 4 to 10 months the pattern characteristic of normal infancy was established: low serum Fe, 50 $\mu\text{g.}$ per 100 ml., high serum Cu, 146 $\mu\text{g.}$ per 100 ml., low saturation of total serum Fe-binding capacity, 12 per cent. and high free red cell protoporphyrin, 70 $\mu\text{g.}$ per 100 ml. In older children differences from adults were less pronounced. Extreme ranges in values were found in different subjects at most ages.

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Data were obtained also for Hb, red cell count and packed red cell volume. Hb fell with serum Fe until at 4 months of age average Hb was 10.7 g. per 100 ml. After 4 months of age red cell count rose without an associated rise in Hb. Average values of Hb, red cell count, mean cell volume and mean corpuscular Hb concentration for children aged 3 to 10 years were 12.2 g., 4.6 millions, 86 c. μ . and 30 per cent., respectively.—F. C. Aitken.

3209

HAGBERG, B. **The iron-binding capacity of serum in infants and children.** *Acta paediat.*, 1953, **42**, 589-591.

See Abst. 612, Vol. 24.

3210

SCHOOLMAN, H. M., DUBIN, A. and HOFFMAN, W. S. **Syndromes involving hyponatremia.** *J. Lab. Clin. Med.*, 1953, **42**, 948-949. *Proc. [Chicago, Ill.]*

See also Absts. 2759, 3321, 3325, 3353, 3419, 3521, 3528, 3716-18, 3793, 3812, 4013.

LYMPH, CEREBROSPINAL FLUID, ETC.

3211

LAURELL, C. B. **Composition of chylomicrons isolated from rat's lymph.** *Acta physiol. scand.*, 1954, **30**, 289-294. [Dept. Clin. Chem., Univ. Lund.]

Intestinal lymph was collected from 6 rats which had been fed on a diet rich in maize oil. Chylomicrons were flocculated by the addition of an aqueous solution of toluidine blue, which was then removed from the fat particles by dialysis or on a column of the cation exchange resin Amberlite IRC 50.

Analysis of the lipid by standard methods showed it to consist mainly of neutral fat, with about 8.5 per cent. phospholipins, about 2.0 per cent. protein and about 0.3 per cent. carbohydrate. G. A. Garton.

3212

PAGE, I. H., LEWIS, L. A. and PLAHL, G. **The lipoprotein composition of dog lymph.** *Circulation Res.*, 1953, **1**, 87-93. [Div. Res., Cleveland Clin. Found., Ohio.]

3213

WALKER, D. G. **Fructose in the foetal fluids of deer.** *Nature*, 1954, **173**, 309-310. [Dept. Biochem., London Hosp. Med. Coll., Turner St., London, E. 1.]

Both allantoic and amniotic fluids of 3 species of deer shot at different stages in pregnancy were found to contain from 100 to 300 mg. fructose per 100 ml., which accounted for a large proportion of

the total reducing substances. Concentrations of total reducing substances and fructose were invariably higher in the allantoic than in the amniotic fluids. The highest concentrations occurred very early in pregnancy, lower values being recorded as the foetal length increased.—W. Godden.

TISSUES

3214

ŠKERLJ, B., BROŽEK, J. and HUNT, E. E. (Jr.) (with CHEN, K. P., CARLSON, W., BRONCZYK, F. and BAKER, P.) **Subcutaneous fat and age changes in body build and body form in women.** *Amer. J. Phys. Anthropol.*, 1954, **11**, 577-600. [Lab. Physiol. Hyg., Univ. Minnesota.]

In 3 groups totalling 84 women, aged 18 to 30, 31 to 45 and 46 to 67 years, there was a tendency to increase in fatness during ageing, the fattening taking place more in the trunk than in the extremities. Inner fat seemed to increase more than subcutaneous fat.—F. C. Aitken.

3215

IKKOS, D., LUFT, R. and SJÖGREN, B. Funktionsprov inom endokrinologien. 2. Bestämning av fördelningen av vätska och elektrolyter i kroppen. [Tests of function in endocrinology. 2. Estimating the distribution of fluid and electrolytes in the body.] *Nord. Med.*, 1954, **51**, 364-367. [Seraphimerlasarett, Stockholm.] English summary.

The application of accepted techniques to study the distribution of water, Na and K in 9 healthy and 18 acromegalic subjects is described.

3216

BARTELHEIMER, H. and SCHWARTZKOPFF, W. Fraktionierte Gewebssaftuntersuchungen. 5. Vergleichende quantitative und elektrophoretische Eiweissbestimmungen bei Normo-, Hypo- und Hyperproteinämien. [Studies of fractionated tissue juice. 5. Comparative quantitative and electrophoretic estimations of protein in (patients with) normal, low and high blood protein.] *Ztschr. ges. exp. Med.*, 1953-1954, **122**, 478-496. [I. Med. Klin., Städt. Krankenhaus Moabit, Berlin.]

The intracellular fluid has a considerable content of protein. Its magnitude cannot be given exactly from the present investigations, but it is lower than that of fluid from cantharides blisters, and is not more than 50 or 60 per cent. of the protein content of serum. The percentage of albumin is often higher in tissue fluid than in serum.—M. B. Richards.

3217

DEMMLING, L., KINZLMEIER, H. and HENNING, N. Über die quantitative Zusammensetzung der

Organproteine. (Elektrophoretische Untersuchungen.) [The quantitative composition of the proteins of organs. (Electrophoretic studies.)] *Ztschr. ges. exp. Med.*, 1953-54, **122**, 416-430. [Med. Poliklin., Univ. Würzburg.]

Organs of rats were ground with sand, treated with 0.067 M phosphate buffer at pH 7.2, and either centrifuged or extracted for about 24 hr. at 3° C. The clear solution thus prepared for electrophoresis was mainly a salt-soluble tissue fluid extract. The organs examined included brain, heart and skeletal muscle, lung, liver, pancreas, gastric and intestinal mucosa, kidney, uterus, testis, smooth muscle and skin.

The 15 representative diagrams given show characteristic differences between organs. Compared with blood plasma, the organs other than the uterus and testis were relatively poor in albumin and rich in globulins. Brain substance was rich in α - and β -globulin, but the γ -component was small, as it was also in uterus and testis. In pancreas and striped muscle the chief component was γ -globulin; smooth muscle showed a more regular globulin distribution.—M. B. Richards.

3218

GARKAVI, P. G. Ob uchastii karnitina v nekotorykh biokhimicheskikh protsessakh i ego soderzhanii v mishtsakh razlichnykh zhivotnykh. [The participation of carnitine in some biochemical processes and its content in the muscles of different animals.] *Biokhimiya*, 1953, **18**, 302-304. [Lab. Biokhim., Akad. Med. Nauk. SSSR, Moscow.]

Carnosine and glycocyamine were not methylated by liver slices from rats when carnitine was used as the methyl source. Carnitine did not affect P metabolism in pigeon muscle, or muscular respiration. The carnitine contents of the muscles of several species, expressed as mg. per 100 g., were: cow 260, rat 57, red and white chicken muscles 124 and 48, pigeon 58, crow 73, frog 52 and carp 76.—W. Hughes.

3219

POLYAKOVA, N. M. Izuchenie sterinov golovno mozga khromatograficheskimi metodami. [A chromatographic study of brain sterols.] *Dokl. Akad. Nauk S.S.S.R.*, 1953, **93**, 321-324. [Inst. Biokhim., Akad. Nauk. Ukrain. SSSR.]

The white and grey matter of human cerebral hemispheres contained 14.0 and 8.0 per cent., respectively, of unsaponifiable substances, on a dry matter basis. Sterols, mainly cholesterol and its isomers, amounted to 90 per cent. of the unsaponifiable material from the white and 85 per cent. of that from the grey matter. Three compounds of low melting-point which gave negative tests for sterols were isolated but not identified.

Unsaponifiable material from grey but not from white matter was shown to contain 7-hydroxycholesterol.—W. Hughes.

3220

SHABANOVA, I. A. Osobennosti sostava i uglevodnofosfornogo obmena myshts kryss pri eksperimentalnoi myshechnoi distrofii. [Composition and phosphate metabolism of rat muscle in experimental muscular dystrophy.] *Biokhimiya*, 1953, **18**, 385-392. [Lab. Biokhim., Akad. Med. Nauk. SSSR, Moscow.]

Muscular dystrophy was produced in rats by depriving them of vitamin E; they were killed and their thigh muscles were compared with those of normal rats. Dystrophic muscle contained 30 per cent. less total P and almost the same amount of inorganic P as normal muscle. The chief decrease was in easily hydrolysable P, including the adenosinephosphoric acids. Free adenylic acid was almost unchanged. Creatine, carnosine and anserine fell, particularly anserine, which decreased by 73 per cent. Amino-N and also N in unidentified compounds increased.

Oxidation of phosphoglyceryl aldehyde, linked with phosphorylation, broke down. The accelerating effect of carnosine on the linking of inorganic phosphate and the formation of phosphoglyceric acid, which occurs in healthy animals, was not observed in rats suffering from muscular dystrophy. W. Hughes.

3221

JOLLY, M. The formation of bone. *Dent. J. Austral.*, 1953, **25**, 133-149. [Dept. Operative Dent., Univ. Sydney.]

3222

CARLSTRÖM, D. and FINEAN, J. B. X-ray diffraction studies on the ultrastructure of bone. *Biochem. biophys. Acta*, 1954, **13**, 183-191. [Dept. Phys. Cell. Res., Karolinska Inst., Stockholm.] French and German summaries.

3223

WEINGES, K. F., LEPPELMANN, H. J. and HARTL, F. Über den Calcium-, Phosphat- und Carbonatgehalt menschlicher Skeletteile im Zusammenhang mit Fragen der Knochenstruktur und ihres Umbaues unter normalen und krankhaften Bedingungen. Vorläufige Mitteilung. [The calcium phosphate and carbonate content of parts of the human skeleton in relation to their structure and metabolism in health and disease. Preliminary communication.] *Klin. Wochenschr.*, 1953, **31**, 1057-1059. [Pathol. Inst., Univ. Munich.]

Sp. gr. was estimated and analyses were made of bone from the roof of the skull and from the

collarbone of 50 male and 50 female bodies of all ages. The mean percentage composition of the roof of the skull and collarbone, respectively, was Ca 31 and 29.5, PO_4 54 and 52.5, and CO_3 7.5 and 7. The higher the sp. gr. and the denser the structure, the lower was the content of Ca, CO_3 and PO_4 . Analysed according to age and sex, the values showed that with age the Ca and CO_3 content of the bone increased, especially in females, with relatively low sp. gr. In chronic heart weakness with cyanosis, the CO_3 content of the bone tended to be high. In pregnancy, values for Ca and P were low, with high sp. gr.

E. M. Hume.

3224

EDELMAN, I. S., JAMES, A. H., BADEN, H. and MOORE, F. D. **Electrolyte composition of bone and the penetration of radiosodium and deuterium oxide into dog and human bone.** *J. Clin. Invest.*, 1954, **33**, 122-131. [Lab. Surg. Res., Peter Bent Brigham Hosp., Boston, Mass.]

Bone samples were obtained from 5 human subjects at post-mortem examination and from dogs under anaesthesia or within an hour after death. There was a close similarity in chemical composition of dog and human bone as expressed on a fat-free dry weight basis. Cortical samples contained from 13 to 22 per cent. water, cancellous bone from 32 to 52 per cent. The mean Na content of the human samples was 234 m. equiv. per kg. fat-free solids, with a range of from 215 to 273. In dog bones the mean was 229 m. equiv. per kg., range from 216 to 239. In all the samples, regardless of species or site, the Ca content was similar, with a mean of 12,000 m. equiv. per kg. fat-free solids.

Seven dogs and one man received intravenous injections of ^{24}Na and samples of blood and bone were taken from 2 to 50 hr. later from the dogs and 26 hr. later from the man. About 45 per cent. of the bone Na in the dogs was exchangeable in the first 4 hr. and there was little change during the next 20 hr. In the human subject the exchangeable Na was 35 per cent.

A more extended study was made on 3 dogs by means of serial bone and blood biopsies during a month after injection of ^{22}Na , while the dogs received a low-Na diet. These results also indicated that about 45 per cent. of the bone Na was readily exchangeable and that the rest showed no tendency to exchange even under conditions of Na depletion.

In 4 dogs injection of D_2O indicated that bone water was completely exchanged with serum water within 4 hr.

The distribution of sodium and water in the body and the study of changes in it are discussed.

D. Duncan.

3225

BERGSTROM, W. H. (with BELL, E. H.) **The relationship of sodium and potassium to carbonate in bone.** *J. Biol. Chem.*, 1954, **206**, 711-715. [Dept. Paediat., Med. Coll. State Univ. New York, Syracuse.]

Data are presented for Na, K, Ca and CO_3 contents of fresh bone from young and adult normal and adult acidotic rats; the ratios CO_3 :Ca, CO_3 :Na + K and Na + K:Ca are also given. Na and carbonate increased with age both absolutely and relatively to Ca. The ratio Na + K:Ca decreased in acidosis, and CO_3 :Na + K increased.

It is suggested that all the Na and K present in bone could be accounted for by the existence of combinations such as $\text{Ca}-\text{O}-\text{CO}_2-\text{Na}$.

D. Duncan.

3226

EGER, W. and LAUP, H. Experimentelle Untersuchungen zur sog. Strontiumrachitis. Ein Beitrag zu den hormonalen und enzymatischen Korrelationen generalisierter Knochenerkrankungen. [Experimental studies of so-called strontium rickets. A contribution to the hormonal and enzymic aspects of generalised bone disorders.] *Beitr. pathol. Anat.*, 1953, **113**, 337-365. [Pathol. Inst., Univ. Göttingen.]

3227

HESS, W. C. and LEE, C. **The amino acid composition of proteins isolated from the healthy enamel and dentin of carious teeth.** *J. Dent. Res.*, 1954, **33**, 62-64. [Dept. Biol. Chem., Sch. Med. Dent., Georgetown Univ., Washington, D.C.]

No difference was found between the protein from the healthy dentine from carious teeth and normal dentine, but there were differences between enamel protein from the healthy portion of carious teeth and from normal teeth. The amino-acids showing greatest changes were methionine, tryptophan, threonine, alanine, tyrosine, leucine and hydroxyproline.—D. Harvey.

3228

STACK, M. V. **The organic content of "chalky" enamel.** *Brit. Dent. J.*, 1954, **96**, 73-76. [Dept. Dent. Med., Guy's Hosp., London.]

From analyses of material from 2 sound teeth it was shown that enamel from 5 areas of the same tooth did not differ in content of organic matter; the ranges for the teeth were from 0.47 to 0.52 and from 0.56 to 0.59 per cent. of the air-dried material.

In samples of chalky enamel from the outer surfaces of 10 teeth the amount was greater, the mean being 1.48 per cent. The ratio of the contents of organic matter of chalky and normal enamel from each tooth was calculated; the range was 3.1 to 3.8 and the mean ratio 3.3. In similar

chalky enamel collected from inner surfaces overhanging major cavities in 10 other teeth the content of organic matter was greater than in samples from outer surfaces; the range was 4.4 to 7.5, mean 5.5 per cent.—D. Harvey.

3229

BENJAMIN, F. B., KEMPEN, R., MULDER, A. G. and IVY, A. C. **Sodium-potassium ratio of human skin as obtained by reverse iontophoresis.** *J. Appl. Physiol.*, 1954, **6**, 401-407. [Dept. Clin. Sci., Univ. Illinois Coll. Med., Chicago.]

3230

LEBLOND, C. P. **Chemical form of the iodine present in the hair of the rat.** *Endocrinology*, 1954, **54**, 104-107. [Dept. Anat., McGill Univ., Montreal.]

3231

HART, P. C. Onderzoek naar het zinkgehalte van runderlevers. [**Zinc content of cattle liver.**] *Tijdschr. Diergeneesk.*, 1954, **79**, 91-98. [Inst. Veeteelt. Onderzoek, T.N.O.] English, French and German summaries.

In continuation of the reports on trace elements in the livers of 62 cows fattened for slaughter, half of them with a methyl-thiouracil compound, the mean Zn content in $\mu\text{g. per g. dry liver}$ was 125 for test cows and 144 for controls; in mg. in the liver, 327 for test animals and 326 for controls. There was no difference in either group between healthy and diseased cows (excluding those with liver fluke). The findings for Mo and Cu have been published in *Landbouwk. Tijdschr.*, 1953, **65**, 192; 738.—I. Leitch.

See also Absts. 3204, 3247, 3407.

DUCTLESS GLANDS AND HORMONES

3232

ZUBIRÁN, S. and GÓMEZ-MONT, F. **Endocrine disturbances in chronic human malnutrition.** *Vitamins and Hormones*, 1953, **11**, 97-132. [Hosp. Enferm. Nutric., Mexico.]

See also Abst. 3334.

3233

DIÉZ RIVAS, F., HERNÁNDEZ MORALES, F. and KOPPISCH, E. **The adrenal gland in tropical sprue.** *J. Amer. Med. Assoc.*, 1952, **150**, 647-650. [Dept. Int. Med., Sch. Med., Univ. Puerto Rico.]

3234

CREUTZFELDT, W., HUSTEN, M. and HAAGER, K. Zur histologischen Funktionsdiagnostik der Nebennieren. (Untersuchungen am Meer-schweinchen beim Schwimmtraining und im Hungerversuch.) [**Histological tests of adrenal function. (Studies on the guineapig in swimming training and starvation.)**] *Beitr. pathol. Anat.*, 1953, **113**, 428-449. [Inst. Pathol., Univ. Freiburg i. Br.]

The effect of moderate muscular effort on the adrenals of guineapigs was compared with that produced by the severe strain of starvation. In animals trained to swim for $1\frac{1}{2}$ hr. daily in water at body temperature there was no increase in heart weight, but the weight of the adrenals relative to bodyweight increased by 40 per cent. after 6 days and 65 per cent. after 15 or 16 weeks. No significant change occurred in the adrenal content of neutral fats and cholesterol and the only histological change was a slight increase in mitosis. Thus the reaction of the adrenals to a

slight chronic stress was purely quantitative, in the sense of a hyperplasia.

Starvation for 4 or 6 days caused little change in the weight of the adrenals relative to the original bodyweight, but considerable qualitative changes in the adrenal cortex, the "progressive transformation" of Tonutti, or the "alarm reaction" of Selye.—M. B. Richards.

3235

FREED, S. C., ROSENMAN, R. H., ST. GEORGE, S. and SMITH, M. K. **Effect of cortisone and ACTH on blood pressure of hypotensive, potassium-deficient rats.** *Circulation Res.*, 1954, **2**, 41-44. [Harold Brunn Inst., Mount Zion Hosp., San Francisco, Calif.]

See also Absts. 3020, 3138, 3141, 3291, 3362, 3323.

3236

GROSS, J. and PITT-RIVERS, R. **Recent knowledge of the biochemistry of the thyroid gland.** *Vitamins and Hormones*, 1953, **11**, 159-172. [Nat. Inst. Med. Res., London.]

3237

PICKERING, D. E., FISHER, D. A., SCOTT, K. G., VAN WAGENEN, G. and SMYTH, F. S. **Growth and metabolism in normal and thyroid-ablated infant rhesus monkeys (*Macaca mulatta*).** 6. **Iodine metabolism in normal and thyroid-ablated infant rhesus monkeys (*Macaca mulatta*).** *Amer. J. Dis. Child.*, 1953, **86**, 574-586. [Dept. Paediat., Sch. Med., Univ. California.]

For earlier papers in the series see Abst. 643 and 1972, Vol. 24.

The iodine metabolism of 6 euthyroid and 4 athyroid immature rhesus monkeys was studied. The uptake of ^{131}I by the thyroids of the normal animals decreased with age. When from 5 to 15 μC . carrier-free ^{131}I was injected intraperitoneally it accumulated in the thyroid or was excreted by the kidneys. In the normal infant monkeys the uptake by the thyroid was considerable; radioactivity counts over the thyroid area in the athyroid monkeys were the same as those over the thigh. The uptake of ^{131}I by the thyroid was almost completely suppressed by an intravenous dose of 250 μg . L-thyroxine per kg. bodyweight, but this effect disappeared in 10 days. It was accompanied by an increased concentration of butyl-extractable I in the serum. Concurrent administration of thyrotropic hormone prevented this suppression of ^{131}I uptake by the thyroid. The rate of disappearance of labelled thyroxine from the plasma was similar in one euthyroid and one athyroid monkey.

Preparation of ^{131}I -labelled thyroxine is described.—B. W. Simpson.

3238

MAQSOOD, M. **Some aspects of thyroid physiology in the male.** *Zootechnia*, 1953, **2**, 258-273; 323-341. [Animal Res. Stat., Univ. Cambridge.] Spanish and French summaries.

The thyroid weight and rate of secretion of thyroxine of male rabbits decreased in relation to bodyweight with advancing age. The relation between thyroid weight and bodyweight is expressed by the equation

$$Y \text{ (thyroid weight in mg.)} = 0.527 x^{0.74} \text{ (} x = \text{bodyweight in g.)}$$

and that between rate of secretion of thyroxine and bodyweight by the equation

$$Y \text{ (} \mu\text{g. l-thyroxine secreted by a rabbit daily)} = 0.43 x^{0.48} \text{ (} x = \text{bodyweight in g.)}$$

In 16-week-old male rabbits there was a significant fall in thyroid weight and in thyroxine secretion during the summer months. Castration at the age of 8 weeks reduced thyroid weight and secretion at 32 weeks, but not at 12 weeks.

Thiouracil formed 0.1 per cent. of the ration except when the rabbits were less than 4 weeks old. Thyroxine was injected. When thyroprotein with an activity equivalent to 0.75 per cent. L-thyroxine was given to 4-week-old male rabbits as 0.06 or 0.1 per cent. of the ration for 12 weeks during the summer there was marked loss of bodyweight and mortality was high. When thyroprotein was given at the same levels in winter, growth was less retarded. When thyroprotein was given at 0.006 per cent., bodyweight increased. Administration of thyroxine below the estimated level of endo-

genous thyroxine secretion had no great effect on growth, but thyroxine given at from 30 to 50 per cent. above the normal secretion rate in 4-week-old rabbits for 4 weeks resulted in an increase of bodyweight. Advancing age reduced the rate of natural secretion, and if the dose of exogenous thyroxine was not reduced in proportion, growth was retarded.

It is suggested that seasonal variations and age should be taken into account when thyroid material is given to stimulate growth.—B. W. Simpson.

3239

BRANDS, K. H. and MONTAG, C. Die Beeinflussung der radioaktiven Jodspeicherung der Schilddrüse durch Keimdrüsenhormone. [Effect of sex hormones on the storage of radio-active iodine in the thyroid gland.] *Arch. Geschwulstforsch.*, 1953, **6**, 11-19. [Strahl. eninst., Univ. Marburg a.d. Lahn.]

3240

HALMI, N. S. **Regulation of the rat thyroid in short-term iodine deficiency.** *Endocrinology*, 1954, **54**, 216-224. [Dept. Anat., State Univ. Iowa, Iowa City.]

Groups of intact and hypophysectomised adult male rats received for about 20 days either a low-iodine diet (Remington) or a high-iodine diet (Rockland pellets). One group of hypophysectomised rats received daily subcutaneous injections of thyrotropic hormone (TSH). All the rats were given a tracer dose of carrier-free radio-active I and were killed 1 or 1½ hr. later. Thyroids were weighed, acinar cell heights were measured and the ratio of thyroid I in mg. per 100 g. thyroid to mg. I in 100 ml. serum was estimated. The pituitaries were also examined histologically.

There was no morphological change in the thyroids attributable to diet, but hypophysectomy reduced their size. In all groups the low-iodine diet increased the capacity of the thyroid for taking up iodide, but the increase was least after hypophysectomy, though TSH restored it to the level seen in intact rats.—B. W. Simpson.

3241

CALESNICK, B., HARRIS, W. D. and JONES, R. S. **Antithyroid action of antibiotics.** *Science*, 1954, **119**, 128-129. [Dept. Pharmacol., Hahnemann Med. Coll., Philadelphia, Pa.]

The effect on the thyroid gland of penicillin and aureomycin was compared with that of iodothiouracil and propylthiouracil. Five groups of 4 young white rats on stock diet of Pratt's Nurishmix with 1 per cent. iodised salt were given for 42 days potassium penicillin G or aureomycin at a level of 1 mg. per kg. food, or iodothiouracil (Itrumi) or propylthiouracil at 2 per cent.; 48 hr. before they

were killed 20 μC . ^{131}I was injected intravenously into each rat.

All the experimental groups showed larger thyroids and lower ^{131}I concentration than controls, but the antibiotics had less antithyroid effect than the thiouracils. Iodothiouracil produced far less vascularity than propylthiouracil.

B. W. Simpson.

3242

GOLDBERG, R. C. and WOLFF, J. **Evaluation of the antithyroid activity of 5-iodo-2-thiouracil.** *Endocrinology*, 1954, **54**, 181-195. [Biol. Labs., Harvard Sch. Dent. Med., Boston, Mass.]

3243

CARE, A. D. **Goitrogenic properties of linseed.** *Nature*, 1954, **173**, 172-173. [Canterbury Agric. Coll., Lincoln.]

Ewes fed on a diet of linseed meal, oats and alfalfa hay produced lambs with large goitres unless KI or thyroxine was added to the drinking water. Groups of mice were given a balanced control ration, and the same ration with 50 per cent. crushed linseed meal and with and without KI, or with aqueous KCN or thiocyanate. One μC . radio-active iodine was injected intraperitoneally into animals from each group and the uptake curves obtained from the thyroids showed that supplementary KI prevented goitre and that the goitrogen in the linseed was thiocyanate. A similar investigation is being made with white clovers.

B. W. Simpson.

3244

TALMAGE, R. V., LOTZ, W. E. and COMAR, C. L. **Action of parathyroid extract on bone phosphorus and calcium in the rat.** *Proc. Soc. Exp. Biol. Med.*, 1953, **84**, 578-582. [U. T.-A.E.C. Agric. Res. Program, Oak Ridge, Tenn.]

Mature male rats were given subcutaneous injections of ^{32}P or ^{45}Ca , followed after 2 hr. by parathyroid extract, and were killed 10 hr. later. In other experiments parathyroid extract was given 24 hr. after the radio-active element and the animals were killed after another 24 or 48 hr.

The excretion of phosphate increased enormously after parathyroid extract; serum phosphate decreased at first, but later increased and finally exceeded the normal. Excretion of Ca increased less than that of P. The loss of radio-active P from the skeleton was much greater than that of Ca.

The action of the parathyroid hormone is discussed in the light of these results.—R. Hill.

3245

JACOBS, E. **Sur le mécanisme d'action de la parathormone : effet du maintien d'un état d'hyperphosphorémie sur l'action hypercalcémiant de l'hormone.** [The mechanism of action of parathormone : the effect of main-

tenance of a high level of phosphorus in the blood on the power of the hormone to raise blood calcium.] *Arch. internat. Pharmacodyn.*, 1953, **95**, 225-233. [Lab. Méd. Exp., Univ. Brussels.] English summary.

The subjects were 7 bitches weighing between 20 and 25 kg. After a fast of 16 hr. a blood sample was taken and from 10 to 30 ml. of a solution containing 9.85 g. $\text{Na}_2\text{HPO}_4 \cdot 12\text{H}_2\text{O}$ and 0.75 g. KH_2PO_4 per 100 ml. was given by stomach tube. From 20 to 30 min. later parathyroid extract was injected, partly intravenously and partly into muscle. Blood samples were taken at intervals and were usually followed by another dose of phosphate solution; the total amount of phosphate solution given ranged from 25 to 100 ml.

By the repeated administration of phosphate a drop in serum P was prevented in 7 out of 9 experiments. In 2 of these 7 there was no effect of the parathyroid hormone on serum Ca, but in the other 5 serum Ca rose. In the last 2 experiments there was a slight fall in blood P and a rise in blood Ca.

The significance of the results is discussed. An extra-renal mechanism is thought to control the rise in serum Ca after administration of parathyroid hormone.—D. Duncan.

See also Absts. 2810, 2954, 3040, 3369.

3246

KINSELL, L. W., MARGEN, S., PARTRIDGE, J. W., MICHAELS, G. D., BALCH, H. E. and JAHN, J. P. (with BILISOLY, J., COELHO, M., KIPP, E. and OLSON, F.) **Metabolic effects of "pituitary growth hormone preparations" in human subjects : summary of quantitative studies extending over a five-year period.** *J. Clin. Endocrinol.*, 1954, **14**, 110-117. [Inst. Metabol. Res., Highland Alameda County Hosp., Oakland, Calif.]

Pituitary growth hormone preparations were without consistent metabolic effect when administered to 3 normal men, a patient with panhypopituitarism, 2 with *retinitis pigmentosa* and 1 with rheumatoid arthritis. In a patient with myxoedema and no endogenous thyroid function 2 such preparations each gave significant retention of N, K and P, with some "rebound" when the preparation was withdrawn. No Na was retained; weight increased during treatment and was lost during "rebound".

The purity of the preparations is questioned, and contamination with thyrotropic hormone is suggested to account for the lack of anabolic effect in most subjects.—D. Duncan.

3247

GRAY, B. J. and YOUNG, F. G. **The influence of growth hormone on the protein composition of**

N.A. and R., July 1954

rat muscle. *J. Endocrinol.*, 1954, **10**, 179-183. [Dept. Biochem., Univ. Cambridge.]

Treatment of adult rats for 15 days with pituitary growth hormone did not affect the composition of the proteins of quadriceps or diaphragm muscle. The adenosinetriphosphatase activity of the myofibrillar fraction was significantly lower in controls.—D. Duncan.

See also Absts. 3018, 3422.

3248

SHIBATA, K. **Experimental studies on the thymus. 2. Relation of the thymus to growth and development.** *Gunma J. Med. Sci.*, 1953, **2**, 273-282. [Dept. Pharmacol., Sch. Med., Gunma Univ., Maebashi.]

For paper 1 see *Gunma J. Med. Sci.*, 1953, **2**, 93.

Groups of littermate rats received from weaning a diet of pressed barley boiled with fish soup and vegetables. Half of each group had the thymus removed and the others had a sham operation.

There was no significant difference in growth or organ weights in either sex after thymus removal,

or in bone weight, length or hardness. In female rats there was no significant effect on age of vaginal opening or of first oestrus.—D. Duncan.

See also Abst. 3142.

3249

STAMLER, J., PICK, R. and KATZ, L. N. **Prevention of coronary atherosclerosis by estrogen-androgen administration in the cholesterol-fed chick.** *Circulation Res.*, 1953, **1**, 94-98. [Cardiovascular Dept., Med. Res. Inst., Michael Reese Hosp., Chicago, Ill.]

The results confirm earlier findings (Pick *et al.*, *Circulation*, 1951, **6**, 276) that oestrogens are highly effective both prophylactically and therapeutically against cholesterol-induced coronary arteriosclerosis in cockerels. Combined administration of oestrogen and androgen, preventing oestrogen feminisation, was at least as effective as oestrogen alone. Neither androgen nor chorionic gonadotropin significantly affected cholesterol-induced coronary or aortic arteriosclerosis in cockerels.

W. Godden.

ENERGY EXCHANGE AND SPECIFIC DYNAMIC ACTION

3250

KERPEL-FRONIUS, Ö., VARGA, F., KUN, K. and VÖNÖCZKY, J. **The relationship between circulation and kidney function in infantile dehydration and malnutrition.** *Acta med. hung.*, 1954, **5**, 27-45. [Dept. Paediat., Univ. Pécs, Hungary.] Russian summary.

Kidney function, cardiac output and oxygen consumption were studied in normal infants, in some showing acute dehydration after gastroenteritis, or simple wasting uncomplicated by infection, or athrepsia, and in others in whom pneumonia appeared along with malnutrition. Methods were as described by the authors in *Ann. paediat.*, 1951, **176**, 11 and *Acta paediat.*, 1951, **40**, 10.

In acute dehydration kidney function was much reduced and cardiac output was decreased but oxygen consumption was not diminished, with the result that the stagnating type of anoxia characteristic of acute circulatory shock appeared. In uncomplicated severe malnutrition kidney function remained normal, cardiac output and oxygen consumption were moderately reduced and anoxia seldom occurred. In athrepsia reduction of cardiac output was in most cases severe and anoxia did occur. When pneumonia was a complication inulin clearance rose, that of *p*-aminohippuric acid remained unchanged, cardiac output increased and oxygen consumption was below normal; in these circumstances the oxygen saturation of cerebral venous blood was well maintained.—D. Harvey.

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3251

MCCANCE, R. A. and STRANGEWAYS, W. M. B. **Protein katabolism and oxygen consumption during starvation in infants, young adults and old men.** *Brit. J. Nutrition*, 1954, **8**, 21-32. [Med. Res. Coun. Dept. Exp. Med., Univ. Cambridge.]

The basal metabolism of 6 newborn male infants was measured for the first 48 hr. of life; no food was given and water intake was restricted. N breakdown during this period was also measured. The results were compared with those for young men aged from 21 to 30 and old men aged from 74 to 84 years, for the last 2 days of a 3-day starvation period.

Average figures for B.M.R. were 50, 26 and 21 Cal. per kg. in 24 hr., for body N breakdown 0.075, 0.17 and 0.12 g. per kg. in 24 hr., and for the proportion of energy derived from protein 4, 18 and 17 per cent., for the infants, young men and old men, respectively.—C. Warner.

3252

WEDGWOOD, R. J., BASS, D. E., KLIMAS, J. A., KLEEMAN, C. R. and QUINN, M. **Relationship of body composition to basal metabolic rate in normal man.** *J. Appl. Physiol.*, 1953, **6**, 317-334. [Natick QM Res. Development Lab., Lawrence, Mass.]

The bodyweight, height, surface area (SA) and B.M.R. of 17 young male adults were estimated, also the antipyrine, thiocyanate and T 1824 spaces,

from which were derived the total body water, intracellular (ICF), extracellular (ECF) and interstitial (ISF) water and plasma volume (PV) in litres.

Total body water being held constant, ICF and ECF were inversely related. The relation of the B.M.R. to the other variables was analysed in detail, and a multiple regression equation was derived:

B.M.R. (Cal. per hr.) =

$$14.13 + 3.79(\text{ISF}) + 0.787(\text{ICF}) - 0.075(\text{PV}) - 4.55(\text{SA}) \pm 3.22.$$

Of the total variation in B.M.R. 65 per cent. was accounted for by this equation. The results are discussed.—S. D. Morrison.

3253

TALAAT, M., HABIB, Y. A. and EL-KHANAGRY, H. **Studies on the basal metabolic rate of normal Egyptians.** *Acta med. scand.*, 1953, **147**, 221-226. [Dept. Physiol., Fac. Med., Alexandria.]

Estimations of B.M.R. were made on normal adults, 63 males and 53 females. All the latter were below the age of menopause, and the estimations were made between the 4th and the 10th post-menstrual day. The mean B.M.R. for males and females was, respectively, 39.86 and 36.99 Cal. per sq.m. per hr. These values do not differ significantly from the modified DuBois standards.

S. D. Morrison.

3254

MURATA, S. [Studies on the basal metabolism of the Japanese. 4. On the basal metabolism of 17-years-old female. 5. On the basal metabolism of 18-years-old female. 10. On the basal metabolism of 13-years-old female. 11. On the variation of basal metabolism in relation to the onset of menstruation.] *Shikoku Acta Med.*, 1953, **4**, No. 2, 12-19; 20-24; No. 6, 22-25; 26-30. [Dept. Hyg., Sch. Med., Univ. Tokushima.] In Japanese: English summary.

4. For 120 girls aged between 17 and 18 years the averages were for respiration rate 18.1 and pulse rate 66.1 per min., R.Q. 0.93, and basal heat production 35.38 Cal. per sq.m. per hr. Mean weight was 49.15 kg. and mean height 151.2 cm.

5. For 93 girls between 18 and 19 years of age corresponding values were 17.0 and 65.7, 0.93, 34.72, 49.62 and 151.68.

Data are tabulated in full for each series.

10. For 81 girls aged between 13 and 14 years the averages were for respiration rate 18.8 and pulse rate 80.8 per min., R.Q. 0.92 and basal heat production 42.77 Cal. per sq.m. per hr. Mean weight was 38.05 kg. and mean height 144.5 cm.

Data are tabulated in full.

11. Metabolic rates were studied in 97 girls

aged 13 years of whom 30 had and 67 had not reached menarche. For the 2 groups the mean values were for weight 42.34 and 36.18 kg. and for height 147.4 and 144.3 cm., respectively. Corresponding values for the other characters for which differences between the groups were found were, body temperature 98.24° and 98.37° F., respiration rate 18.61 and 18.99 per min., pulse rate 78.5 and 81.3 per min., B.M.R. 41.52 and 43.85 Cal. per sq. m. per hr. (From summary.)—D. Harvey.

3255

YOSHIMURA, H., INQUE, G., YAMAMOTO, M., YAMAJI, R., TANIMURA, Y., OOHARA, S., TAKAOKA, W., KOISHI, H., FUNAKI, H. and HAYASHI, M. **A contribution to the knowledge of dehydration of human body; some remarks on physiological effects of prolonged complete starvation.** *J. Biochem., Tokyo*, 1953, **40**, 361-375. [Inst. Physiol., Kyoto Prefectural Med. Coll.]

A Buddhist bishop, Soken Enami, aged 46, abstained completely from food and water for 8 days for religious reasons. He permitted the authors to study his metabolism. He lay on his bed and rose from time to time to pray; his prayers lasted about 1½ hr. daily. Mental and physical tranquillity were indispensable for enduring the abstinence.

Studies were made of the metabolism of energy, water, protein, Na, K, Cl and acid-base balance, of the physiology of respiration, circulation, temperature, regulation and renal excretion, and of the properties of blood and urine related to them. The findings are fully set out in tables and graphs.

The B.M.R. and body temperature were slightly raised. About 23 per cent. of the total body water, amounting to about 8 litres, was lost, of which about half represented insensible water loss, though the rate of loss of the latter was only about half the normal. More than half of the lost water was supplemented in the body by liberation of intracellular water which was mainly associated with nutrients. The circulating blood volume was reduced by about 16 per cent., but contraction of the blood vessels, especially in the limbs, afforded compensation. When exercise was taken the circulation and respiration were forced to accelerate, and the heart was then threatened with exhaustion in its effort to overcome the circulatory disturbances caused by blood concentration. Such acute heart exhaustion is presumed to be the cause of death in dehydration.—E. M. Hume.

3256

STRYDOM, N. B. **Some physiological aspects of adaptation to heat.** *S. African Med. J.*, 1954, **28**, 112-113. [Lab. Appl. Physiol., Transvaal Chamber of Mines Res. Lab.]

N.A. and R., July 1954

3257

ÅSTRAND, P. O. **A study of capacity for hard muscular work of 17 to 19-year-old male youths.** *Arbeitsphysiologie*, 1953, **15**, 251-254. [Dept. Physiol., Central Gymnastic Inst., Stockholm.]

Using the technique previously reported (Åstrand, "Experimental studies of physical working capacity in relation to sex and age," Munksgaard, Copenhagen, 1952) 34 well trained young men, 17 to 19 years of age, were set to run on a treadmill at 1° uphill at different speeds up to their maximum for from 6 to 8 min. The average maximum oxygen intake per kg. bodyweight was 59.2 ml. per min. for the 17-year-olds, 61.6 for the 18-year-olds and 61.3 for the 19-year-olds. The corresponding blood lactic acid values were 111, 107 and 101 mg. per 100 ml. At speeds of 8 and 12 km. per hr., the youngest group attained a heart rate 10 to 15 beats faster than that of the 19-year-olds and their lactic acid values were about 14 mg. per 100 ml. higher. If the 19-year-old youths are regarded as full grown, the 17-year-olds should be regarded as juniors with respect to their capacity for hard muscular work demanding endurance.

W. Godden.

3258

PHILLIPS, P. G. **The metabolic cost of common West African agricultural activities.** *J. Trop. Med. Hyg.*, 1954, **57**, 12-20. [Colonial Med. Res. Committee's Lab. Hot Climate Physiol., Oshodi, nr. Lagos, Nigeria.]

The activities for which 7 Nigerians provided data were sitting, standing, walking and stool stepping and others of an agricultural or industrial character, i.e., grass cutting, bush clearing, head panning, log carrying, tree felling and sawing. The open method of measurement was used and, where possible, the Douglas bag was wheeled on a trolley instead of being carried. All observations were made 2 hr. after breakfast.

Analyses of sample diets are tabulated; energy intakes were generally in excess of 2750 Cal., of which about 10, 24 and 66 per cent., respectively, were from protein, fat and carbohydrate.

The mean metabolic cost of sitting or standing was 51 Cal., and for stool stepping 12 or 24 times per min. it was 120 or 202 Cal. per sq.m. per hr. Compared with British sailors, reported on by Dunham *et al.* (*Med. Res. Council Report to Royal Naval Personnel Research Committee*, London, 1946) these Africans could be regarded as being more efficient at stool stepping. Walking at 3 m.p.h. required 120 Cal. per sq.m. per hr., a somewhat lower metabolic rate than that reported for Europeans, but when differences in clothing and in the weight of equipment carried are considered, the rate may not be significantly lower.

The means for other activities, in Cal. per sq.

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m. per hr., were: log carrying with 20-kg. load 138; head panning with 20-kg. load 142 and with 30 kg. 173; grass cutting 177; hoeing 178; head panning with 35-kg. load 206; sawing 237; bush clearing 245; tree felling 332. In carrying a head load there was an increase in mean oxygen consumption which was linear with weights up to about 20 kg., but when these went up to 35 kg. there was a disproportionate increase in energy cost. Practices in Nigeria are in general agreement with these findings since, for long distances, porters' loads are normally about 14 kg. and rarely exceed 23 kg., but for short distances, as in the tin mines, they may exceed 27 kg.

The findings cannot be taken as confirmatory of the conclusions by U.S. workers (Robinson *et al.*, *Human Biol.*, 1941, **13**, 139) that the negroid is physiologically more efficient than the white subject.—D. Harvey.

3259

EGLI, R., GRANDJEAN, E. and TURRIAN, H. **Arbeitsphysiologische Untersuchungen an Hackgeräten.** [Studies of physiology of work with hoeing tools.] *Arbeitsphysiologie*, 1953, **15**, 231-234. [Inst. Hyg., Tech. Hochsch., Zürich.]

By methods previously reported (Abst. 1839, Vol. 23) the energy output by 5 trained school-children was compared when using 3 types of hoe to loosen light and hard soils. On light soil for a given energy output twice as much ground could be covered with a circular hoe as with a hacking hoe. On heavy soil the circular hoe was still the most efficient but the differences between the 3 types were small.—W. Godden.

3260

SCHOLZ, G. **Die Beziehung zwischen Schrittlänge und Schrittzahl beim natürlichen Gang.** [Relation between length of step and frequency of step in natural walking.] *Arbeitsphysiologie*, 1953, **15**, 211-222. [Inst. Verkehrswirtschaft., Tech. Hochsch., Hanover.]

One subject, 23 years old, walked without a load along a level 100 m. cinder track at different speeds and with different lengths and frequencies of step. Within the limits of 30 to 120 m. or 65 to 138 steps per min., speed, frequency and length of step were interdependent; there was a hyperbolic relation between speed and frequency. In natural walking there was a tendency to adjust frequency and length of step so that energy expenditure was at a minimum.—W. Godden.

3261

RYHMING, I. **A modified Harvard step test for the evaluation of physical fitness.** *Arbeitsphysiologie*, 1953, **15**, 235-250. [Dept. Physiol., Central Gymnastic Inst., Stockholm.]

A step test, in which the Harvard test (Abst. 3517, Vol. 14) was modified by adopting platforms 40 cm. high for young men, 27 cm. for older men and 33 cm. for young women, all making 22.5 steps per min., was compared with a more complicated bicycle test. For young men the average results for step test at 40 cm. and bicycle test at 900 kg. per min. were: oxygen intake 2.11 ± 0.04 and 2.15 ± 0.02 litres per min. and pulse rate 130 ± 1.5 and 132 ± 1.9 per min. For young women the average values for step test at 33 cm. and bicycle test at 600 kg. per min. were: oxygen intake 1.56 ± 0.03 and 1.48 ± 0.02 litres per min., pulse rate 140 ± 1.6 and 138 ± 2.2 per min. Mechanical efficiency did not vary with body height or weight. An analysis of the pulse rate after and during work for 61 individual average results from step test and 66 from bicycle test gave a correlation coefficient $r = +0.77 \pm 0.04$ and a regression line $y = -21.4 + 0.77x$.

The pulse rate from 1 to 1.5 min. after work gives only a rough idea of the pulse rate during work if the results are compiled from different individuals, and cannot be used if the work is relatively light.—W. Godden.

3262

ALBRECHT, H., VALENTIN, H. and VENRATH, H. Über die Atmung und das Herzminutenvolumen bei Arbeit und Sport, sowie die Herzleistung. [Respiration and minute volume during work and sport, and cardiac output.] *Ztschr. ges. exp. Med.*, 1953, **122**, 356-368. [Med. Klin., Univ. Cologne.]

Includes description of a new ergometer.

3263

JONGBLOED, J. and VAN GOOR, H. Zuurstof-toediening bij sport. [Giving oxygen during exercise.] *Nederland. Tijdschr. Geneesk.*, 1954, **98**, 491-497. [Physiol. Lab., Rijks Univ., Utrecht.] English summary.

The experiments were with a bicycle ergometer on which the subjects did a measured amount of work over short periods, usually 2 to 5 min. In intervals between spurts of work they breathed either oxygen or air. Sceptics experienced no improvement from breathing oxygen: those who expected to be improved by oxygen did better or felt better if they thought they breathed oxygen, whether it was oxygen or air, but did and felt worse when breathing oxygen if they thought it was air.—I. Leitch.

3264

KARL, C. M., TUTTLE, W. W. and DAUM, K. Effect of protein source on specific dynamic action. *J. Amer. Dietetic Assoc.*, 1953, **29**,

1208-1210. [Dept. Physiol., State Univ. Iowa, Iowa City.]

The subjects were 14 healthy women aged 20 to 26. Each ate 2 test meals, similar in protein, energy and fat values, but the protein in one was entirely of animal origin and in the other of plant origin. Basal oxygen consumption was estimated before and for $4\frac{1}{2}$ hr. after the meal.

Each meal caused a significant increase in resting oxygen consumption, but the difference between the 2 meals in this respect was not significant.

D. Duncan.

3265

KAHN, E. The effects of heat stress on patients suffering from cardiac failure and infantile malnutrition. *S. African Med. J.*, 1954, **28**, 110-112. [Dept. Paediat., Baragwanath Hosp., Johannesburg.]

Studies of which fuller details are to be published later were made of sweat secretion in control subjects and in infants with nutritional oedema and after partial recovery. Untreated oedematous infants secreted less than 100 mg. per 6 sq. in.; for all other subjects the range was from about 100 to 700 mg. [Time and temperature are not stated.] Congestive cardiac failure, with which a similar impairment is known to be associated, is not a feature of infantile malnutrition, but in affected infants there is evidence that cardiac output is small and peripheral circulation poor. The way in which this may handicap African infants living in ill ventilated huts with corrugated-iron roofs or carried by their mothers in thick woollen blankets is indicated.—D. Harvey.

3266

AXELSSON, J. and ERIKSSON, S. Energy requirements for maintenance of domestic animals. Their measure and relationship to body weight. *Kgl. Lantbrukshögsk. Ann.*, 1953, **20**, 51-70. [Inst. Animal Nutrit.]

A critical review.

3267

HUTCHISON, H. G. and MABON, R. M. Studies on the environmental physiology of cattle in Tanganyika. 1. Preliminary observations on the seasonal diurnal variations in the rectal temperature of local Zebu cattle. *J. Agric. Sci.*, 1954, **44**, 121-128. [Livestock Res. Sect., Mpwapa, Tanganyika Territory.]

Morning and afternoon rectal temperatures of 10 Zebu cows were taken for 134 days. During the first 61 and the last 20 days all had access to pasture of poor quality; for the other 35 days 6 cows received 4 lb. concentrates, 15 lb. maize silage and 10 lb. poor quality hay and the other 4 cows received 10 lb. hay only.

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The atmospheric shade temperature ranged at the beginning of the experiment from 64° to 76° F. and at the warmest period of the observations from 71° to 83° F. The diurnal variation in rectal temperature was approximately from 99.0° to 102.5° F. There was more variation in morning than in afternoon rectal temperatures. Morning temperatures were significantly higher when the ration was supplemented, but afternoon temperatures were not affected. There was a significant negative correlation between atmospheric temperature and the daily mean rectal temperature of the cows in the morning. The physiological implications of the results are briefly discussed.

J. N. Aitken.

3268

RAGAB, M. T., GHANY, M. A. and ASKER, A. A. **Effect of shading and sprinkling on cattle and buffaloes in Egypt.** *Indian J. Vet. Sci.*, 1953, **23**, 205-215. [Animal Breeding Dept., Fac. Agric., Fouad I Univ., Cairo.]

After being exposed to sun for 2 hr. 8 buffaloes, 9 Egyptian cows, 2 Jerseys, 3 pure Shorthorns and 8 grade Shorthorns were subjected to different cooling treatments and the body temperature and respiration and pulse rates were measured hourly.

Shading, indoor and outdoor, after sprinkling with water for 3 or 5 min. decreased body temperature more than shading alone. When the time spent in shade was increased from 1 to 2 hr. body temperature was further reduced in all except the native cattle. Respiration rate followed the same general trend as body temperature. There was no consistent change in pulse rate.

J. N. Aitken.

3269

FITZGERALD, L. R. **The oxygen consumption of neonatal mice.** *J. Exp. Zool.*, 1953, **124**, 415-425. [Div. Anat., Med. Units Div. Univ. Tennessee, Memphis.]

By means of Warburg manometers and constant temperature water-baths, oxygen consumption was estimated in mice during the first 5 days of life. At 35° C. total oxygen consumption closely followed the wet weight, with an average of about 1.9 ml. per g. per hr., which is somewhat higher than that reported for adult mice. The Q_{O_2} was approximately 12.0. The rate of oxygen consumption fell more or less linearly with falling temperature from 35° to 10° C. and then began to level off. There was no difference attributable to strain, sex, time of day, time after feeding or activity.—D. Duncan.

3270

JACOBSON, F. H. **Calorimetry of rats immersed in cool water.** *Amer. J. Physiol.*, 1954, **176**, 287-296. [Dept. Physiol., Sch. Med., Univ. Rochester, N.Y.]

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Immobilised rats were immersed to the neck in 1500 ml. water at 20° C. for periods of up to 90 min. Temperatures of colon and of calorimeter water were measured at 6-min. intervals, and heat production was measured by indirect calorimetry. Colonic temperature fell rapidly at first and then slowly approached a value of about 24.0° C. The calorimeter water rose to about 22.5° C., the colonic always being above the water temperature. Heat production fell slowly, after a brief rise on immersion. From the data obtained, and assuming a constant unmeasured heat loss, the specific heat of the rat is estimated to be 0.96. The coefficient for combining deep and surface body temperatures, for the calculation of the rate of heat loss, is estimated to be 0.53.—S. D. Morrison.

3271

WILHELMJ, C. M., MEYERS, V. W., MILANI, D. P., McDONOUGH, J. R., RACHER, E. M., MCGUIRE, T. F., WALDMANN, E. B. and MCCARTHY, H. H. **The effect of diet on the blood pressure and heart rate of normal dogs. Protein and carbohydrate.** *Circulation Res.*, 1953, **1**, 419-427. [Dept. Physiol., Sch. Med., Creighton Univ., Omaha, Nebr.]

Trained dogs were fasted until the blood pressure fell to a stable value and were then fed on isocaloric diets, high in protein or in carbohydrate, either at low maintenance level or at twice this amount. At the low level of feeding blood pressure and pulse rate rose promptly but moderately above the fasting levels, but there was no significant difference between the effects of the 2 types of diet. At the higher level of energy intake the systolic blood pressure and pulse rate rose significantly higher on the high-carbohydrate than on the high-protein diet. Addition of 25 g. NaCl to the high-carbohydrate diet caused a further rise of blood pressure. When a diet of half meat, half crackers was given there was evidence of an antagonistic effect on blood pressure between meat and carbohydrate.—W. Godden.

3272

WILHELMJ, C. M., MEYERS, V. M., MILANI, D. P., McDONOUGH, J. R., MCGUIRE, T. F., RACHER, E. M., WALDMANN, E. B. and MCCARTHY, H. H. **The influence of diet on the blood pressure and heart rate of normal dogs. 1. Protein and carbohydrate.** *J. Lab. Clin. Med.*, 1953, **42**, 966-967. *Proc.*

3273

ERIKSSON, S. and KIVIMÄE, A. **Diurnal variation of food consumption and carbon dioxide production in laying hens.** *Acta Agric. scand.*, 1954, **4**, 71-77. [Inst. Animal Nutrit., Royal Agric. Coll., Uppsala.]

Six laying hens were housed in individual cages in a room lit usually from 8 a.m. to 10 p.m. On one day a week lighting was continued for 24 hr. and feed consumption was measured every 2 hr. In each period from 9 a.m. to 7 p.m. the mean consumption lay between 14 and 16 g., but in the remainder of the 24 hr. consumption was significantly lower, from 7 to 11 g.

Measurements of carbon dioxide production on each of these hens for a 2-day period also suggested a 24-hr. rhythm, but the differences between periods were less. They ranged from a mean 2-hourly production of 6.1 g. CO₂ between 7 and 9 a.m. to one of 7.1 g. between 5 and 7 a.m.

K. J. Carpenter.

See also Absts. 2803, 3053.

CARBOHYDRATES

3274

LOURAU, M. L'absorption intestinale du glucose est-elle un phénomène réversible? [**Is intestinal absorption of glucose a reversible phenomenon?**] *C.R. Acad. Sci.*, 1954, **238**, 842-844.

Absorption of glucose was studied by the method of Cori in guineapigs with high blood glucose produced by intramuscular injection of glucose. Passage of glucose from the blood into the intestine was not brought about by alterations in the concentration of glucose solution ingested. It is concluded that in the intact animal absorption is irreversible.

Disappearance of glucose from the gut was slight at blood sugar levels of 700 to 800 mg. per 100 ml. and was completely arrested when blood sugar reached 1000 mg. per ml.—D. Duncan.

3275

LOURAU, M. Glycémie et absorption intestinale du glucose. Recherches sur l'intestin isolé. [**Blood sugar and intestinal absorption of glucose. Research on the isolated intestine.**] *C.R. Acad. Sci.*, 1954, **238**, 936-938.

Glucose was injected into a segment of guinea-pig's intestine isolated *in situ* between 2 ligatures. The segment was that between the hepato-renal flexure of the duodenum and the middle of the jejunal loop below the ligament of Treitz. High blood sugar levels were produced by injection of 50 per cent. glucose.

Two types of absorption curve were obtained, depending on the presence or absence of glucose in the intestine before the experiment began. If glucose was previously absent absorption fell quickly, but if several experiments were made on the same loop absorption increased. Raising the blood sugar level significantly depressed absorption and prevented the increase in successive experiments. This suggests a direct effect of the blood sugar on absorption in intact animals.—D. Duncan.

3276

HESTRIN-LERNER, S. and SHAPIRO, B. **Absorption of glucose from the intestine. 1. *In vitro* studies. 2. *In vivo* and perfusion studies.** *Biochem. biophys. Acta*, 1953, **12**, 533-541 ;

1954, **13**, 46-60. [Lab. Pathol. Physiol., Hebrew Univ., Jerusalem.] French and German summaries.

1. When saline solutions containing equimolar concentrations of glucose were introduced into the lumen of the isolated small intestine of the rat and formed the surrounding fluid, a decrease in concentration of glucose occurred in the surrounding fluid, but this was slight in comparison with absorption from the lumen. The glucose that disappeared from the lumen could not be recovered from the intestinal wall. When glucose containing ¹⁴C was placed in the lumen, the ¹⁴C passed to the outer fluid, but not as glucose or as CO₂; it was in a form that was not fermented by baker's yeast. Oxygen consumption by the isolated intestine was such that, assuming complete combustion, only 15 per cent. of the glucose absorbed could be accounted for, and as the ¹⁴C was not present as CO₂ the oxygen used can have been concerned with only partial combustion of glucose.

The substance containing ¹⁴C was isolated and purified. It was no known intermediary of glucose degradation and remains to be identified.

2. The absorption of glucose was studied in rats by comparison of the glucose concentrations in arterial and portal blood 5 to 12 min. after glucose was introduced into the small intestine, which was ligated at both ends, and also using the small intestine perfused with ox serum and red cells.

With the first method the expected excess of glucose in the portal blood did not occur, negative or only small positive values being found. The expected values were estimated from the glucose loss from the small intestine and the calculated blood flow in the portal vein. The introduction of glucose labelled with ¹⁴C showed more ¹⁴C in the portal vein than in the arterial blood, even though glucose was less. A considerable portion of the ¹⁴C was contained in a non-fermentable substance. Similar results were obtained with the second method. Some lactic acid was found, which could have accounted for one-quarter of the glucose lost. The use of glucose labelled with ¹⁴C showed that in 12 min. about one-third passed into the portal blood and two-thirds remained in the wall of the intestine.

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The conclusion is drawn that glucose is metabolised in the gut epithelium to a non-fermentable substance which accumulates in the epithelium and passes slowly into the portal bloodstream. Complete combustion accounts for only a negligible part of the glucose absorbed.—A. T. Phillipson.

3277

KOMROWER, G. M. **Blood sugar levels in babies born of diabetic mothers.** *Arch. Dis. Childhood*, 1954, **29**, 28-33. [St. Mary's Hosps., Manchester.]

Blood sugar was estimated in cord blood and in heel blood taken at $\frac{1}{2}$, 1, 2, 4, 12 and 24 hr. after birth from 40 infants of diabetic mothers and 21 of normal mothers. Twenty-five of the infants of diabetic mothers were given 50 per cent. glucose by mouth, 2 g. in all, at intervals during the first 8 hr. of life. The results are shown in tables and graphs.

Blood sugar values of normal infants showed a wide scatter but no great rise or fall in individuals; 2 had values of 36 mg. per cent. or less but no clinical sign of hypoglycaemia. In the infants of diabetic mothers blood sugar fell during the first 2 or 3 hr. and then stabilised at a level below that of the normal infants. Little advantage resulted from administration of glucose. Though many blood sugar values below 35 mg. per cent. were found, only 4 infants showed clinical signs of hypoglycaemia; there was no evidence that hypoglycaemia contributed to the deaths of 5 infants of diabetic mothers.—W. M. Deans.

3278

CHOREMIS, K. B. and NICOLAIDES, P. Beitrag zum Stoffwechsel der Kohlenhydrate bei dystrophischen Säuglingen. [Metabolism of carbohydrates in dystrophic infants.] *Ztschr. Kinderheilk.*, 1954, **74**, 123-132. [Kinderärztl. Klin., Univ. Athens.]

The blood sugar curves of dystrophic infants after administration of glucose were much the same as those of normal children. The highest blood sugar values in both were found after 1 hr. and the lower level reached by the dystrophic infants was ascribed to the depletion of their blood and tissues. The descending portion of the dystrophic curves showed slight retardation, and the blood sugar values did not return to their original level within 3 hr., when the normal curves had reached subnormal levels. Similar differences between the dystrophic and eutrophic curves were found after administration of adrenaline, and of insulin combined with glucose. The experiments indicate that so far as glucose absorption is concerned, the dystrophic infant shows no disturbance but tolerates sugar well, even in quantities based not on its actual weight but on what its weight should be.—M. B. Richards.

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3279

MURDOCH, P. **Hyperglycaemia and haemorrhagic shock in pregnancy. Preliminary study.** *J. Obstet. Gynaecol. Brit. Empire*, 1953, **60**, 785-792. [Res. Dept., Royal Maternity Hosp., Glasgow.]

Blood samples were obtained from 40 patients in haemorrhagic shock at different stages of pregnancy or *post partum*.

The average blood sugar value was 222 mg. per 100 ml., range 110 to 364 mg. Shock of short duration produced little change in blood sugar, and only after about 30 min. was there an appreciable rise; it was avoided in 5 patients who received blood transfusion 10 to 15 min. after the development of shock. Whatever the cause of shock, *post partum* haemorrhage, accident, abortion or intraperitoneal haemorrhage, the longer it remained untreated the higher did the blood sugar rise. In accidental haemorrhage, however, the rise tended to be delayed. There was no evidence of a terminal fall, the highest value occurring an hour before death in a patient in profound shock. In response to treatment the blood sugar declined with the fall in pulse rate.—D. Duncan.

3280

TÖRNBLOM, N. and HELLMAN, S. **On the mechanism of diabetes in obesity. Studies on arteriovenous glucose difference in normals and in obese diabetics.** *Acta med. scand.*, 1953, **147**, 331-348. [Med. Clin., Univ. Hosp., Upsala.]

3281

ARIAS VALLEJO, E. **Hiperglucemia e hiperlipemia en la diabetes. [Hyperglycemia and hyperlipaemia in diabetes.]** *Rev. española Enferm. Apar. digest. Nutricion*, 1953, **12**, 603-605.

3282

GREEN, H. N. and STONER, H. B. **Effects of injury on carbohydrate metabolism and energy transformation.** *Brit. Med. Bull.*, 1954, **10**, 38-41. [Dept. Pathol., Univ. Sheffield.]

3283

JONXIS, J. H. P. and HUISMAN, T. H. J. **The excretion of sugars after the intravenous administration of invert sugar.** *Arch. Dis. Childhood*, 1953, **28**, 446-449. [Child. Hosp., Univ. Groningen, The Netherlands.]

The children studied had been admitted to hospital with signs of shock associated with acute infectious diseases. They were given intravenous infusions, which during the last 24 hr. consisted of 10 per cent. solutions of glucose or invert sugar.

Sugar excretion in both groups was negligible, ranging from 0.4 to 2.2 per cent. of the amount administered. The average fluid loss, however,

was 1245 ml. in 24 hr. with glucose, against 1090 ml. with invert sugar. When the sugar infusions were given more rapidly, glucose loss increased. With invert sugar the loss of glucose increased but that of fructose remained almost negligible; the total loss was still less than half the loss from an equivalent amount of glucose.

In view of the smaller losses in both sugar and fluid, invert sugar is considered to be better than glucose for administration to children.

D. Duncan.

3284

BERTOLINI, A. M. and BAROZZI, C. P. **Studies on glucose-1-phosphate in the blood of normal subjects and of patients with pancreatic diabetes.** *Acta med. scand.*, 1953, **147**, 427-429. [Inst. Med. Pathol., Univ. Milan.]

3285

HÖRMANN, E. Über die Pathogenese des Milchsüßkernstars der weissen Ratte. [**Pathogenesis of lactose cataract in the white rat.**] *v. Graefes Arch. Ophthalmol.*, 1954, **154**, 561-573. [Forschungslab., Kinderklin., Univ. Munich.]

The author surveys the literature on galactose cataract and the metabolism of lactose and compares different hypotheses. From his own experiments he found that rats on a diet containing 70 per cent. of α - or β -lactose died in a few days in a condition of extreme emaciation. With 30 per cent. galactose and 40 per cent. oat flakes, degenerative changes occurred in the lens. Injection of cocarboxylase prevented these effects of lactose and galactose. It is suggested that lactose and galactose prevent the fermentative breakdown of carbohydrate, and that cocarboxylase inhibits the action of these sugars and prevents the development of galactose cataract. The cause of this cataract is assumed to be interference with the conversion of pyruvic acid into lactic acid in the lens.—M. B. Richards.

3286

GOODALE, W. T. and HACKEL, D. B. **Myocardial carbohydrate metabolism in normal dogs, with effects of hyperglycemia and starvation.** *Circulation Res.*, 1953, **1**, 509-517. [Med. Clin., Peter Bent Brigham Hosp., Boston, Mass.]

For the method used see Title 2798, Vol. 24.

In dogs under light Nembutal anaesthesia the coronary sinus, pulmonary artery and a peripheral artery were intubated, and coronary blood flow, myocardial oxygen consumption, cardiac output and left ventricular work and efficiency were estimated. Four of the dogs were starved, receiving a reduced diet for 2 weeks and then nothing but water and vitamins for 18 days.

The amount of pyruvate, lactate, glucose and oxygen extracted by the myocardium from the

blood in normal dogs was directly related to the arterial level of each substance independently of the others and was not significantly correlated with coronary blood flow or left ventricular work. When arterial glucose concentration was raised by glucose infusion, lactate and pyruvate were increased, with corresponding increases in their coronary arterio-venous differences.

The mean total oxygen utilisation was 19.5 ± 1.5 ml. per 100 g. left ventricular myocardium per min. About two-thirds of this was potentially accounted for by lactate, pyruvate and glucose extraction, assuming complete substrate oxidation. However, at high arterial levels of lactate or glucose, the collective oxygen equivalents exceeded the simultaneous oxygen extraction, which may imply storage of metabolites at these levels of supply. The mean normal myocardial R.Q. from 14 observations was 0.91 ± 0.03 , closely correlated ($r = +0.90$) with the percentage of the total oxygen extraction attributable to carbohydrate uptake.

Starved dogs had high arterial pyruvate levels, but lactate and glucose did not differ significantly from normal. Extraction rates of all 3 metabolites were significantly reduced and the mean R.Q. was about 0.69, suggesting utilisation of fat. A metabolic block in carbohydrate oxidation is postulated to account for this.—D. Duncan.

3287

TERLIZZI, L. Accrescimento ponderale di ratti maschi giovani tenuti a diete sintetiche a vario tenore di glucosio. [**Weight increase of young male rats maintained on a synthetic diet with a varying content of glucose.**] *Boll. Soc. ital. Biol. sper.*, 1953, **29**, 1108-1110. [Ist. Fisiol., Univ. Bari.]

3288

HANKE, O. Untersuchungen über Blutzucker und Insulinhypoglykämie bei Hühnern. [**Studies of blood sugar and insulin hypoglycaemia in hens.**] *Ztschr. ges. exp. Med.*, 1953, **122**, 238-248. [Med. Klin., Univ. Greifswald.]

For 20 healthy fowls the average blood sugar value was 182 mg. per 100 ml. without definite difference between the sexes. After a 48-hr. fast the values remained within the normal range. Four hens with severe tuberculosis of the abdominal organs gave a lower blood sugar value than normal, and the value was reduced by fasting. Convulsions caused by strychnine or picrotoxin reduced blood sugar. In young males during the period of rapid growth blood sugar showed a steady increase, followed by a decrease after puberty. Insulin injections, intravenous or subcutaneous, reduced blood sugar, values as low as 31 mg. per 100 ml. being found. Male birds were more sensitive than females to insulin; shock was

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always observed in adults, and convulsions in younger birds, but without fatal results. It is suggested that this greater sensitivity in the male may be due to an influence of the sex hormones.

M. B. Richards.

3289

STEPANENKO, B. N. and AFANAS'EVA, E. M. O stroenii glikogenov razlichnykh vidov zhivotnykh. [The structure of glycogens from different species of animals.] *Dokl. Akad. Nauk S.S.S.R.*, 1953, **90**, 1095-1098. [Lab. Fiziol. Chim., Akad. Nauk SSSR.]

Glycogens from rabbits and frogs at different times of the year, studied with respect to molecular weight, chain unit and absorption curves for compounds formed with iodine, and the effect of β -amylase, showed structural differences. The molecules of glycogen from frogs as a rule were more compact than those of glycogen from rabbits.

W. Hughes.

3290

ARENSMEYER, E. and MOLINSKI, H. Über den Gehalt an Glykogen und Kalium in Blut, Leber, Muskel und Niere von Ratten nach Hunger, Glucosemast, Insulin- und Adrenalin-einwirkung. [Glycogen and potassium contents of blood, liver, muscle and kidney of rats after starvation, glucose feeding, insulin and adrenaline.] *Ztschr. ges. exp. Med.*, 1953-54, **122**, 564-577. [Physiol. Chem. Inst., Univ. Münster, Westphalia.]

Glycogen and K were estimated in the liver, muscle and kidney of rats, to test the theory that K is taken up and bound in the formation of glycogen. To achieve the greatest possible changes in the glycogen content of the tissues, the animals were subjected to starvation, loading with glucose, or injection with insulin or adrenaline. In spite of

changes in the glycogen content the K content, on both dry and moist basis, remained constant. It is concluded that combination with K does not take place in glycogen synthesis.

Observations made in the course of the work showed that red and white thigh muscle contained equal amounts of K, and that the K content of muscle was greater in spring than in winter.

M. B. Richards.

3291

KELLER, N. and LINDEN, G. Der Einfluss von Desoxycorticosteron auf den Glykogengehalt der Leber bei weissen Ratten. [Effect of deoxycorticosterone on the glycogen content of the liver in the albino rat.] *Arch. exp. Pathol. Pharmacol.*, 1954, **221**, 219-227. [Med. Klin., Justus Liebig Hochsch., Giessen.]

3292

GIDEZ, L. I. and KARNOVSKY, M. L. The metabolism of C^{14} -glycerol in the intact rat. *J. Biol. Chem.*, 1954, **206**, 229-242. [Dept. Biol. Chem., Harvard Med. Sch., Boston, Mass.]

Glycerol labelled with ^{14}C in the α - or β -position was given intravenously, intraperitoneally or by stomach tube to fasting rats. Whatever the route of administration, about the same proportion of the amount given, from 30 to 238 mg., was converted to CO_2 . From 70 to 100 per cent. of blood sugar and 15 to 39 per cent. of liver glycogen was synthesised from glycerol. The specific activity of blood lipids was parallel to that of liver lipids. Liver triglyceride glycerol rapidly reached a specific activity about 3 times that of phospholipoid glycerol and declined in activity much more rapidly than the latter.—G. A. Garton.

See also Absts. 2978, 2979, 3052, 3096, 3133, 3213, 3295, 3301, 3302, 3352, 3353, 3439, 3443, 3447, 3492.

PROTEINS AND PROTEIN DERIVATIVES

3293

MURTHY, H. B. N., SWAMINATHAN, M. and SUBRAHMANYAN, V. Effects of partial replacement of rice in a rice diet by tapioca flour on the metabolism of nitrogen, calcium and phosphorus in adult human beings. *Brit. J. Nutrition*, 1954, **8**, 11-16. [Central Food Technol. Res. Inst., Mysore.]

Experiments with rats (Abst. 3520, Vol. 24) suggested a study of the effects on man of replacing with tapioca flour 25 per cent. of the rice in a typical South Indian diet, particulars of which are given. The subjects were 6 healthy male laboratory workers aged from 22 to 37. They ate the rice diet and the rice-tapioca diet for 2 successive 12-day periods; urine and faeces were collected during the last 5 days of each period.

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N retention was much the same on both diets. Two subjects were losing Ca on the rice diet but on the rice-tapioca diet all 6 retained Ca and the difference in average Ca retention was significant. Average P retention was also significantly greater on the rice-tapioca diet, although the P intake was about the same; this is ascribed to the fact that tapioca contains very little phytate P.

W. M. Deans.

3294

BEAL, J. M., FROST, P. M. and SMITH, J. L. (with FELTS, J.) The influence of caloric and potassium intake on nitrogen retention in man. *Ann. Surg.*, 1953, **138**, 842-845. [Surg. Metabol. Lab., Dept. Surg., Univ. California, Los Angeles.]

Three adult male surgical patients were fed intravenously with solutions of glucose, alcohol, saline and protein hydrolysate. The patients were in positive N balance when 80 m. equiv. K were added, but in negative balance when K was not given. Reduction of glucose intake from 500 to 100 g. daily in a patient given K reduced N retention, but the patient remained in positive N balance.—F. C. Aitken.

3295

MUNRO, H. N. and WIKRAMANAYAKE, T. W. **Absence of a time factor in the relationship between level of energy intake and protein metabolism.** *J. Nutrition*, 1954, **52**, 99–114. [Dept. Biochem., Univ. Glasgow.]

When dogs on a diet of casein, sucrose, fats, salts and vitamins were given extra glucose with the daily meal, urinary N output fell: when the glucose was given 7 or 12 hr. after the meal, the immediate fall was progressively less, but if the treatment was continued for several days the N retention was similar whether the glucose was given at the same time as or 12 hr. after the main meal.

When young adult men on adequate diets took 200 g. sucrose with their meals or 5½ hr. after the last meal of the day, there were similar falls in N output from the first or the second day of the experiment, respectively. Similarly, when rats were given extra carbohydrate or extra fat at the same time as or 12 hr. apart from the main meal, there were increases in N balance.

It is concluded that protein utilisation is affected in two ways by carbohydrate: firstly, the presence of some carbohydrate in the protein meal improves utilisation; secondly, extra carbohydrate and fat, whether taken at the same time as or apart from the protein, act interchangeably as energy sources in sparing protein.—C. Warner.

3296

QUINN, M., KLEEMAN, C. R., BASS, D. E. and HENSCHER, A. **Nitrogen, water and electrolyte metabolism on protein and protein-free low-calorie diets in man. 1. Water restriction. 2. Adequate water intake.** *Metabolism*, 1954, **3**, 49–67; 68–77. [Biochem. Branch, Quartermaster Climatic Res. Lab., Lawrence, Mass.]

1. Ten healthy young men were given an adequate diet for a control period of 13 days during which balance studies were made. The men were then divided according to body fat and weight into 2 groups of 5 and were given for 9 days 800 ml. water daily and a synthetic diet supplying about 900 Cal. For one group the diet contained 43.14 g. protein as egg albumin; for the other group the protein was replaced by carbohydrate. The diets were not made equal in mineral content.

Data obtained from the experimental period were for the protein and non-protein group, respectively, mean bodyweight loss 5.5 and 4.1 kg.; mean body fat loss 2.7 and 2.0 kg.; mean cumulative negative N balance 56.4 and 59.9 g.; mean negative water balance 5703 and 4130 ml.; mean 24-hr. urinary creatinine output 1.70 and 1.46 g. There was no appreciable difference in electrolyte balance or in losses of circulating Hb, packed cell volume and total circulating protein between the 2 groups. Ketosis occurred in the protein group and in one subject in the non-protein group. The results showed that added protein at the 900-Cal. level increased the loss of body water without appreciably improving N balance.

2. In a second experiment 2 groups of 5 men were given diets similar to those in the first experiment and all subjects drank each day for 9 days 27 ml. water per kg. lean body mass. Daily water intakes in the protein and non-protein groups were, respectively, 1747 and 1767 ml. Mean cumulative negative water balances were 4704 and 4807 ml. Mineral and N balances followed the pattern of the first experiment.

F. C. Aitken.

3297

SQUIRE, J. R. **The nephrotic syndrome.** *Brit. Med. J.*, 1953, **ii**, 1389–1399. [Dept. Exp. Pathol., Univ. Birmingham.]

This lecture is based on a study of 19 patients exhibiting proteinuria, including 8 with the uncomplicated nephrotic syndrome, defined as oedema, protein in urine and low albumin in blood, without hypertension, electrolyte disorder, retention of N.P.N. or appreciable excess of red blood cells in the urine.

Changes in colloid osmotic pressure of plasma, as measured by an apparatus described, are discussed in relation to plasma volume; serum protein and losses and replacement of the several fractions are described.

N balance studies are recommended. Patients with long histories of proteinuria were grossly deficient in body protein. The low urea output is considered to be a manifestation of N conservation for plasma protein replacement. At the same time, amino-acid excretion may be high.

Prognosis and treatment are discussed, especially the need for high-protein feeding.

D. Duncan.

3298

CUTHBERTSON, D. P. **Interrelationship of metabolic changes consequent to injury.** *Brit. Med. Bull.*, 1954, **10**, 33–37. [Rowett Res. Inst., Bucksburn, Aberdeenshire.]

3299

VARTAINEN, I. and APAJALAHTI, J. **Effect of ingested protein and tyrosine on circulating**

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eosinophils. *J. Clin. Endocrinol.*, 1953, **13**, 1502-1506. [2. Med. Clin., Univ. Helsinki.]

After an overnight fast 20 healthy adults received 200 g. water or solutions of 0.5 g. gelatine, 0.5 g. casein or 0.3 g. tyrosine per kg. bodyweight. Eosinophil counts made 1, 2, 4 or 6 hr. later showed that gelatine had no effect, but casein and tyrosine caused decreases of 33 per cent., the peak being attained in 4 hr. In 6 other subjects 0.6 g. tyrosine per kg. bodyweight produced a decrease of 43 per cent. after 4 hr.—W. Godden.

3300

MUIRHEAD, E. E., JONES, F. and GRAHAM, P. (with BROOKS, B. and LESCH, W.) **Hypertension following bilateral nephrectomy of the dog. The influence of dietary protein on its pathogenesis with emphasis on its development in the absence of "extracellular fluid" expansion.** *Circulation Res.*, 1953, **1**, 439-453. [Dept. Pathol., Southwestern Med. Sch., Univ. Texas, Dallas.]

By increasing the intake of casein after removal of both kidneys high blood pressure was produced in dogs even without high salt intake. The hypertension appeared early in the experiment and was not associated with increase in either blood or extracellular fluid volume. Vomiting and diarrhoea were slight, Na, Ca and fluid balances were maintained, and bodyweight tended to fall as hypertension mounted.

Losses of K and N appeared to be due mainly to tissue breakdown, and the relatively greater loss of N suggested a redistribution of K away from the extracellular fluid.

In the pathogenesis of hypertension after nephrectomy, not only tissue breakdown and redistribution of K and Na, but also diet may be concerned.—W. A. Greig.

3301

MARSHALL, M. W. and WOMACK, M. **Influence of carbohydrate, nitrogen source and prior state of nutrition on nitrogen balance and liver composition in the adult rat.** *J. Nutrition*, 1954, **52**, 51-64. [Bur. Human Nutrit., Agric. Res. Admin., Washington, D.C.]

Rats received for 3 weeks diets containing the essential and non-essential amino-acids at levels of 0.1 per cent., sucrose or maize dextrin, salts, fats and vitamins, with or without previous protein depletion on a similar but N-free diet.

The N balances were more negative and the accumulation of fat in the liver was much greater with sucrose than with dextrin. Raising the level of the essential amino-acids to 0.2 per cent. made the N balances positive and eliminated the differences due to the carbohydrate source. When extra glutamic acid was given, N balances improved

in rats given sucrose but not in those given dextrin. The livers of rats given sucrose contained more protein than those of the animals given dextrin, except with the N-free diets.

It is suggested that maize dextrin in the diet in some way facilitates the use of liver protein or its precursors, and so reduces N output.—C. Warner.

3302

HARPER, A. E., MONSON, W. J., ARATA, D. A., BENTON, D. A. and ELVEHJEM, C. A. **Influence of various carbohydrates on the utilization of low protein rations by the white rat. 2. Comparison of several proteins and carbohydrates. Growth and liver fat.** *J. Nutrition*, 1953, **51**, 523-537. [Dept. Biochem., Univ. Wisconsin, Madison.]

Groups of 6 weanling rats were fed to appetite. The basal diet had the percentage composition: sucrose 81.6, casein 9.0, DL-methionine 0.3, maize oil 5.0, salt mixture 4.0 and choline chloride 0.13, with vitamins. Supplements were included at the expense of sucrose, and casein was omitted when other proteins were tested.

In every experiment with 9 per cent. casein, rats receiving dextrose grew 2 or 3 times as fast as those on sucrose, with cerelose intermediate. Deposition of liver fat was greatest with sucrose or fructose and least with dextrose or cerelose. The effect of dextrose on growth occurred also when the casein was replaced by wheat gluten supplemented with lysine, egg albumin, fibrin or an amino-acid mixture. With wheat gluten or fibrin liver fat was low whatever the carbohydrate source, and with albumin it was high, but dextrose decreased it when amino-acids were given. Addition of gelatine, zein or extra casein to the basal diet reduced liver fat deposition.

In pair-feeding experiments in which the food intake of rats fed on the dextrose diet was kept down to that of rats receiving sucrose, the difference in growth was slight, but the rats receiving dextrose had less liver fat. In a long experiment the liver fat of the animals receiving sucrose, which rose to 32.9 per cent. after 4 weeks, dropped after 12 weeks to 14 per cent., the same as that of rats receiving dextrose.

Xanthine oxidase activity in liver homogenates was lower than in rats fed on 18 per cent. casein, especially in those which received sucrose.

It is suggested that all the results could spring from improved utilisation of dietary protein when dextrose replaces sucrose.—D. Duncan.

3303

STENRAM, U. **The nucleolar size in the liver cell of rats fed high and non protein diets.** *Exp. Cell. Res.*, 1953, **5**, 539-541. [Dept. Histol., Univ. Lund.]

Groups of 4 weanling white rats were given diets with or without 22 or 3 per cent. crude casein with fat, sucrose, salt mixture and vitamins. After 10 days they were killed and the middle lobe of the liver was fixed. Thin paraffin sections stained with gallocyaminchromalum showed the nucleoli to be larger in rats having little or no protein. No difference of effect was found between 3 per cent. and no protein, and there was no difference in the number of nucleoli present in liver sections from the 3 groups.—A. M. Copping.

3304

MANNELL, W. A. and ROSSITER, R. J. **Nutritional deficiency and Wallerian degeneration in the rat. 1. Effect of protein depletion on the concentration of nucleic acid and phospholipid in intact and sectioned nerves.** *Brit. J. Nutrition*, 1954, 8, 44-55. [Dept. Biochem., Univ. W. Ontario, London, Canada.]

The percentage composition of the basal diet was: salt mixture 4, vitamin mixture 1, cellulose 5, brewer's yeast 2, casein 20, maize starch 48, cod liver oil 0.1, maize oil 3.9 and water 16. A protein-deficient diet was produced by replacing the casein with an equal quantity of maize starch. The protein-deficient rats had received the latter diet to appetite for 69 days. Age controls received the basal diet during the same period; weight controls received the basal diet for 16 days and were killed when their bodyweight was the same as that of depleted rats; the weight and age controls received restricted amounts of the basal diet so that their mean bodyweight followed that of the depleted rats.

The depleted rats lost more than 25 per cent. of their initial bodyweight. One sciatic nerve was cut in the thigh of each rat 8 days before the animal was killed. For control rats there was a highly significant correlation between bodyweight and the wet weight of the sciatic nerve per unit length. For a given bodyweight the mean nerve weight of protein-depleted or weight and age control rats was significantly greater than in the other groups. Protein depletion caused some loss in nerve weight as compared with age controls.

Nucleic acid concentration in the nerves of depleted rats was less than in weight controls, but similar to that in age controls. Phospholipin concentration was related to weight rather than to age. Protein depletion did not affect nucleic acid concentration, but phospholipin increased. Nucleic acid increased and phospholipin decreased in the cut nerves, and these changes were little affected by protein depletion.—D. Duncan.

3305

MANDEL, P., JACOB, M. and MANDEL, L. **Effet du jeûne protéique prolongé sur les acides pento-**

senucléiques et deoxypentosenucléiques du pancreas et des surrenales. [Effect of prolonged protein fast on pentose- and deoxypentose nucleic acids of the pancreas and adrenals.] *C.R. Acad. Sci.*, 1954, 238, 288-290.

3306

HARA, M. **Experimental study on treatment of wound in case of hypoproteinosis.** *Nagoya J. Med. Sci.*, 1953, 16, 12-26. [2. Dept. Surg., Sch. Med., Univ. Nagoya.]

In all, 262 mice were used. The basal diet consisted, in g., of casein 8, arrowroot starch 24, lard 6, "Ebios" 1.8 and salt mixture 3, with 12 drops of cod liver oil. In a protein-free diet the casein was replaced by 8 g. starch. After 2 weeks the liver protein value in mice of the deprived group was about half that in the normal group. Healing of superficial wounds was delayed by 6 or 8 days in protein-deficient, as compared with normal, rats. The effects of essential amino-acids, singly and in combination, are reported; methionine, lysine and tryptophan were most effective in promoting healing. Folic acid and vitamin B₁₂ supplements were ineffective in complete protein deficiency, but they enhanced the value of a methionine supplement.—D. Duncan.

3307

MEYER, J. H. **Interactions between a high concentration of dietary sodium chloride and various levels of protein when fed to the growing rat.** *J. Nutrition*, 1954, 52, 137-154. [Dept. Animal Husb., Univ. California, Davis.]

Rats received diets containing from 10 to 55 per cent. casein and 0.5 or 15.5 per cent. NaCl, both to appetite and by paired feeding, and weight gain, food and water consumption, plasma albumin, kidney weight, extracellular fluid, digestibility of organic matter and N, and N retention were measured.

The principal effects were decreased food consumption, gain per g. casein consumed, plasma albumin and N retention, and increased kidney weight, water consumption, N digestibility and urinary N loss on increasing the salt content of the diet; increased kidney weight with increasing casein on the high- but not on the low-salt diet; and increased extracellular fluid on the low-protein, high-salt diet.—C. Warner.

3308

HUGOT, D., CAUSERET, J. and FLANZY, M. **Effet de l'alcool éthylique sur la perte intestinale et sur la perte rénale d'azote au cours de l'inanition azotée.** [Effect of ethyl alcohol on intestinal and renal loss of nitrogen during nitrogen deprivation.] *C.R. Acad. Sci.*, 1954, 238, 619-621.

Rats received a ration of percentage composition starch 50, sucrose 32, arachis oil 12, salt mixture 4, agar 2, with vitamins. It contained 40 mg. N per 100 g. Groups received daily by tube, per 100 g. bodyweight, 6 ml. 10 per cent. ethanol, 6 ml. red wine diluted to contain 10 per cent. ethanol, or 6 ml. water. Urinary and faecal N were estimated for 4 successive 5-day periods.

The alcohol as such or as wine had no effect on the excretion of faecal endogenous N; it caused a marked but transitory rise in urinary N which could not be explained as a washing out of breakdown products.—W. Godden.

3309

SAUBERLICH, H. E., CHANG, W. Y. and SALMON, W. D. **The comparative nutritive value of corn of high and low protein content for growth in the rat and chick.** *J. Nutrition*, 1953, **51**, 623-635. [Dept. Animal Husb., Agric. Exp. Stat., Alabama Polytech. Inst., Auburn.]

Maize of protein content 6.8 to 13.6 per cent. was used. Weanling Sprague Dawley rats and day-old Leghorn chicks were the test animals.

When the high- and low-protein maize samples were given on the basis of equal proportions of maize in the diet the high-protein samples gave the better growth, but on the basis of equal protein content in the diets the low-protein maize was better. The low-protein maize was deficient in lysine, tryptophan, isoleucine, threonine and valine and possibly other amino-acids. The high-protein maize was deficient in lysine and tryptophan only, and not so severely so as the low-protein maize. Soya bean meal was the most efficient natural protein supplement and gave the most satisfactory results with the high-protein maize diet.—P. C. Jowsey.

3310

SURE, B. (with EASTERLING, L., DOWELL, J. and CRUDUP, M.) **Protein supplementation. Relationships between milled rice and milled white corn meal.** *J. Agric. Food Chem.*, 1953, **1**, 1207-1208. [Univ. Arkansas, Fayetteville.]

Since previous work (Title 1925, Vol. 16; Abst. 2309, Vol. 17) had shown that the proteins of milled rice were biologically superior to those of milled maize and milled wheat, their supplementary value along with these cereals was investigated. Wistar albino rats, 30 days old and weighing from 50 to 55 g., in groups of 12 males and 12 females, were fed for 8 weeks on diets containing 7 per cent. of protein entirely supplied by milled wheat flour or 6 per cent. of protein entirely supplied by milled white maize meal, or the same with half or a third of the wheat flour or maize meal replaced by milled rice. The other constituents of the diet were cellu flour 2, salt mixture 4, vegetable

shortening 2, cod liver oil 2 and wheat germ oil 1 per cent., with cerelese, and crystalline B vitamins were given to each rat daily as follows: vitamin B₁, riboflavin, nicotinic acid, pyridoxine 25 µg. each, Ca pantothenate 150 µg., p-aminobenzoic acid 3 mg., choline chloride 6 mg., inositol 1 mg. The rats were weighed weekly and protein efficiency ratios (weight gain per g. protein intake) were calculated.

When half the wheat protein was replaced by rice protein average weight gain over 8 weeks increased by 114 per cent. and protein efficiency ratio by 86 per cent. With one-third replacement the increases were 54 and 56 per cent. With maize meal the supplementary value of rice was even greater, the increases being 236 and 165 per cent. for half replacement and 190 and 148 per cent. for one-third replacement. The effect is ascribed to the proteins and amino-acids of the rice and not to any other substance present in it.

It is suggested that poor people subsisting mainly on maize in such regions as the southern United States, Mexico, Guatemala, South Africa and Yugoslavia should grow more rice where conditions are suitable.—W. M. Deans.

3311

KADKOL, S. B., MURTHY, H. B. N., PINGALE, S. V. and SWAMINATHAN, M. **Effect of methyl bromide fumigation on the biological value of the proteins in rice and groundnut.** *Bull. Central Food Technol. Res. Inst., Mysore*, 1953, **3**, 19-20.

Fumigation of raw undermilled rice and groundnut kernels with methyl bromide did not significantly decrease the methionine content of their protein or affect their protein efficiency ratio for rats as estimated by the method of Osborne *et al.* (*J. Biol. Chem.*, 1919, **37**, 223).—J. S. Thomson.

3312

RAO, G. R., MURTHY, H. B. N. and SWAMINATHAN, M. **Supplementary relations of Bengalgram and groundnut proteins to bajra (*Pennisetum typhoideum*) proteins.** *Bull. Central Food Technol. Res. Inst. Mysore*, 1953, **3**, 44.

In experiments with rats it was found that the protein efficiency ratio (Osborne *et al.*, *J. Biol. Chem.*, 1919, **37**, 223) of bajra (*Pennisetum typhoideum*) protein was higher than that of wheat protein when given at a 10 per cent. level of protein intake. The proteins of groundnut cake and Bengal gram (*Cicer arietinum*) supplemented those of bajra.—J. S. Thomson.

3313

SIMAKOV, P. B. **Znachenie globina i gema v pitanii. [Nutritional importance of globin and haem.]** *Vop. Pitani.*, 1954, **13**, 7-11.

[Lab. Physiol. Pitan. Rastushch. Organ., Inst. Pitan., Akad. Med. Nauk SSSR, Moscow.]

Rats, one month old, were given an artificial diet containing only 1.7 per cent. protein (brewer's yeast). When 25 per cent. or more of the original weight had been lost, 16 per cent. bovine globin was added to the diet for 40 days. Some animals were given, in addition, 35 mg. *isoleucine* for 4 days. A third group were given 9 per cent. casein for 6 days and for a further 7 days also 30 mg. haem. The methods of preparation of globin and haem are described. Weight changes and blood changes were studied in all animals.

The animals given globin gained little weight, 0.26 g. in 24 hr., but became more active and healthier in appearance. Addition of *isoleucine* increased weight gain to 1.5 to 4.0 g. in 24 hr. In animals given haem, weight increases of the order of 3 g. in 24 hr. were recorded independently of increases attributed to casein.

Globin raised the blood globin and haematin content slightly and the protein of the red-cell stroma considerably, but had no influence on catalase activity.

Haem assisted in the rise of blood haematin, slightly raised blood globin and protein of red-cell stroma, but did not affect catalase activity.

D. W. Taylor.

3314

MCCAUGHY, M. L., OWEN, E. C., HENRY, K. M. and KON, S. K. **The utilization of non-protein nitrogen in the bovine rumen. 8. The nutritive value of the proteins of preparations of dried rumen bacteria, rumen protozoa and brewer's yeast for rats.** *Biochem. J.*, 1954, **56**, 151-156. [Hannah Dairy Res. Inst., Kirkhill, Ayr.]

Dried preparations of rumen bacteria and rumen protozoa were compared with dried brewer's yeast at the 8 per cent. protein level as the sole source of N for growth of young rats.

The biological values of dried bacteria and dried protozoa were the same and greater than that of the yeast. True digestibility was greater for rumen protozoa than for bacteria.

The relations between the rumen bacteria and their host are discussed.—A. T. Phillipson.

3315

HOLMES, P., MOIR, R. J. and UNDERWOOD, E. J. **Ruminal flora studies in the sheep. 5. The amino-acid composition of rumen bacterial protein.** *Austral. J. Biol. Sci.*, 1953, **6**, 637-644. [Inst. Agric., Univ. W. Australia, Netherlands.]

For previous papers see Abst. 574, Vol. 24.

Rumen bacteria were separated from plant residues and protozoa and the amino-acid composition (amino-N as percentage of protein N) was

studied. The protein contained about half as much methionine and *isoleucine* as whole egg protein. It is considered that the nutritional value of rumen bacteria as a source of protein is limited by these two amino-acids.

Bacterial proteins from sheep grazing and on dry rations were closely similar in composition.

A. T. Phillipson.

3316

ROSE, W. C., HAINES, W. J. and WARNER, D. T. **The amino acid requirements of man. 5. The rôle of lysine, arginine, and tryptophan.** *J. Biol. Chem.*, 1954, **206**, 421-430. [Div. Biochem., Noyes Lab. Chem., Univ. Illinois, Urbana.]

For methods see the earlier papers (Absts. 2222, Vol. 20; 663, Vol. 21 and 819, Vol. 22). The absence of lysine or tryptophan from the diet produced negative N balance, loss of appetite, fatigue and nervousness. No effect was seen when arginine was omitted from the diet.

This paper completes the qualitative study of the amino-acids essential for adult man; valine, leucine, *isoleucine*, threonine, methionine, phenylalanine, lysine and tryptophan are indispensable, but all others could be omitted from the diet without harm.—C. Warner.

3317

LO BIANCO, S. **Determinazioni dell'aminoaciduria nel lattante mediante cromatografia su carta. [Estimation by paper chromatography of amino-acids in the urine of infants.]** *Boll. Soc. ital. Biol. sper.*, 1953, **29**, 1134-1135. [Ist. Clin. Pediat., Univ. Parma.]

Urine of 24 healthy babies up to a year old was analysed for amino-acids by paper chromatography. Artificially fed babies excreted more amino-acids than those that were breast fed. The amount excreted increased with age during the first year. Only small amounts of essential amino-acids and traces of sulphur amino-acids were excreted.—E. M. Hume.

3318

JONXIS, J. H. P. **Amino-acidurie. [Amino-aciduria.]** *Nederland Tijdschr. Geneesk.*, 1954, **98**, 598-601. [Groningen.]

A lecture.

3319

SANDLER, M. and PARE, C. M. B. **Starvation amino-aciduria.** *Lancet*, 1954, **266**, 494-495. [Shorncliffe Military Hosp., Kent.]

Chromatograms of urine from 15 people before and after starvation for from 36 to 108 hr. showed T-spot (β -amino-isobutyric acid) as follows: in 2 before and during starvation, in 9 during starvation, in 4 neither before nor during starvation.

N.A. and R., July 1954

The implications of the findings are discussed with special reference to malignant disease.

F. C. Aitken.

3320

BICKEL, H., *et al.* **Cystine storage disease with aminoaciduria and dwarfism (Lignac-Fanconi disease).** *Acta paediat.*, 1953, **42**, 581-585. See Abst. 4615, Vol. 23.

3321

MANN, G. V., FARNSWORTH, D. L. and STARE, F. J. **An evaluation of the influence of DL-methionine treatment on the serum lipids of adult American males.** *New Engl. J. Med.*, 1953, **249**, 1018-1019. [Dept. Nutrit., Harvard Sch. Pub. Health, Boston, Mass.]

A group of 24 men whose blood lipoproteins of the S₇ 12-20 class were 50 mg. or more per 100 ml. were given 3 g. methionine by mouth in 3 equal doses daily for 6 weeks. They continued their activities and diet without change. Blood samples were collected fortnightly during the treatment and 2 weeks after it ceased.

The data for total cholesterol content and for the levels of S₇ 12-20 and S₇ 20-100 lipoproteins were analysed statistically; no evidence was found that the serum lipids were influenced by the relatively large amount of methionine ingested.

D. Harvey.

3322

DENTON, A. E. and ELVEHJEM, C. A. **Availability of amino acids in vivo.** *J. Biol. Chem.*, 1954, **206**, 449-454. [Dept. Biochem., Coll. Agric., Univ. Wisconsin, Madison.]

Dogs with cannulae in the portal vein were given semipurified diets in which casein, beef or zein was the protein constituent; the concentrations of the 10 essential amino-acids in the portal blood were estimated at intervals after feeding. With casein or beef there was an increase in the amino-acid concentration of the blood within an hour, and earlier with casein than with beef. With zein there was an initial decrease, followed by an increase at 6 hr.; the decrease was possibly due to initial absorption of carbohydrate and delayed absorption of amino-acids. The amino-acids present in highest concentration in the diet showed the greatest increases in their concentration in portal blood.—C. Warner.

3323

DENTON, A. E. and ELVEHJEM, C. A. **Amino-acid concentration in the portal vein after ingestion of amino-acid.** *J. Biol. Chem.*, 1954, **206**, 455-460. [Dept. Biochem., Coll. Agric., Univ. Wisconsin, Madison.]

An amino-acid mixture was substituted for the protein in the diets described above. Rapid

absorption took place, with peaks in the portal blood concentration at 1, 2½ and sometimes 6 hr. When sucrose replaced the N source the blood amino-acid concentration decreased initially and then increased at about 6 hr.

Phenylalanine, tryptophan and possibly leucine were not absorbed so rapidly as the other amino-acids.—C. Warner.

3324

MAGEE, D. F. **Effect of essential amino-acids on cholic acid production in dogs.** *Amer. J. Physiol.*, 1954, **176**, 223-226. [Dept. Pharmacol., Sch. Med., Univ. Washington, Seattle.]

The failure of the *d*-forms of essential amino-acids to increase cholic acid production in dogs with bile fistulae (Abst. 598, Vol. 23) is confirmed. The bile-producing effect of a given weight of casein can be accounted for by the essential amino-acids which it contains.—W. Godden.

3325

PASQUINELLI, F. and D'ALESSANDRO A. **Ricerche sul comportamento del P inorganico del siero dopo somministrazione di singoli aminoacidi. [Behaviour of inorganic P in the serum after administration of individual amino-acids.]** *Boll. Soc. ital. Biol. sper.*, 1953, **29**, 1237-1239. [Ist. Patol., Univ. Florence.]

Inorganic P and amino-N were estimated in blood from rabbits weighing about 2 kg., before and 30 and 60 min. after intravenous injection of 20 ml. of a 0.5 M solution of glycine, alanine, glutamic acid, histidine, arginine or leucine. With all there was reduction of the values for serum inorganic P; there was no significant difference between the values.—E. M. Hume.

3326

CSALAY, L., HORVÁTH, G. and SÓCS, J. **Wirkung des Aminosäuremangels auf das experimentelle Magengeschwür, sowie auf die Histamin- und Acetylcholinreaktionen. [Effect of amino-acid deficiency on experimental gastric ulcer and on the histamine and acetylcholine reactions.]** *Acta physiol. hung.*, 1954, **5**, 293-303. [Pathophysiol. Inst., Med. Univ., Budapest.] Russian summary.

3327

RICHARDSON, L. R., BLAYLOCK, L. G. and LYMAN, C. M. **Influence of dietary amino-acid supplements on the free amino-acids in the blood plasma of chicks.** *J. Nutrition*, 1953, **51**, 515-522. [Dept. Biochem. Nutrit., Texas Agric. Exp. Stat., College Station.]

Chicks fed from hatching to 6 weeks of age on a basal ration of groundnut meal 32 parts, minerals 2.5, vitamins and ground milo to 100 finished with

a mean weight of 364 g. Groups of 25 birds fed on the same ration supplemented with either 0.4 per cent. DL-methionine, 0.2 per cent. L-lysine, or both together finished with mean weights of 330, 443 and 567 g., respectively.

Some free amino-acids were estimated in pooled plasma samples. Samples from each group gave values for tryptophan within the range of 60 to 64 μ g. per ml. The control group gave plasma containing 29 μ g. methionine per ml., and the supplemented groups 61, 28 and 64 μ g., respectively. For lysine the values were 15, 12, 33 and 14 μ g. per ml., respectively, for the control and supplemented groups. The values for arginine and valine were raised by addition of lysine alone, but not by lysine and methionine together.

In a further trial with an adequate control diet the lysine content of plasma was significantly reduced, from 108 to 78 μ g. per ml., by the addition of an excess of methionine to the diet, even though there was no adverse effect on the rate of growth. The arginine and valine contents were also reduced by this addition; that of tryptophan remained unchanged.—K. J. Carpenter.

3328

ROTHSTEIN, M. and MILLER, L. L. **The metabolism of L-lysine-6- C^{14} .** *J. Biol. Chem.*, 1954, **206**, 243–253. [Dept. Radiation Biol., Sch. Med. Dent., Univ. Rochester, N.Y.]

Lysine-6- ^{14}C was injected intraperitoneally into rats with large amounts of unlabelled suspected metabolites, and the metabolites were then isolated from the urine and examined for radioactivity.

Lysine could be converted to acetate and α -keto-glutarate, apparently by independent routes, to glutarate, and, in small amounts, to formate and glycine. When large amounts of unlabelled lysine were injected with the labelled, δ -aminovalerate was also labelled, and it is suggested that the conversion of lysine through the α -keto-acid to δ -aminovalerate was a secondary reaction.

In rats treated with phloridzin the glucose isolated from the urine was labelled predominantly in C atoms 3 and 4, with some activity in atoms 1 and 6 and a small amount in 2 and 5; acetoacetate was also labelled. The latter and the 3:4-labelled glucose were probably formed from glutaric acid and the other C atoms of the glucose from formate.

With similar techniques it was shown that α -aminoadipic acid-6- ^{14}C could be converted into glutarate, and that glutaric acid-1:5- ^{14}C could be converted into α -ketoglutarate and acetate in a way similar to the lysine conversion.

The findings were consistent with the reaction sequence lysine \rightarrow α -aminoadipate \rightarrow glutarate \rightarrow α -ketoglutarate and acetate.—C. Warner.

3329

ARMSTRONG, M. D. **The utilization of L- and D-phenylalanine by the rat.** *J. Biol. Chem.*, 1953, **205**, 839–848. [Lab. Study Hereditary Metabol. Disorders, Coll. Med., Univ. Utah, Salt Lake City.]

Rats receiving from 0.5 to 4.0 per cent. D-, L- or DL-phenylalanine in the diet showed no ill effect. Growth rate, food consumption and food efficiency were greatest with the L- and least with the D-isomer; with D- and DL-phenylalanine growth was better at the 1 per cent. than at the 0.5 per cent. level. The response from 0.5 per cent. phenylalanine and 1 per cent. tyrosine was similar to that from 1.2 per cent. phenylalanine alone. In paired feeding experiments, growth and food efficiency were only slightly greater with L- than with D-phenylalanine; considered with the absence of phenylpyruvic acid from the urine of animals given D-phenylalanine at moderate levels, this suggested that there was little loss in inversion.

It is suggested that the lower consumption of diets containing the D-isomer is due to the animals' awareness in some way of an initial imbalance of amino-acids during the time taken for the D-isomer to be deaminated to the corresponding keto-acid in the kidney, transported to the liver and reaminated as the L-isomer; in support of this, phenylpyruvic acid was found to have an effect intermediate between those of D- and L-phenylalanine.—C. Warner.

3330

WRETLIND, K. A. J. **The availability of the isopropyl ester of L- and D-phenylalanine and 3, 6-dibenzyl-2, 5-diketopiperazine for growth in rats.** *Acta physiol. scand.*, 1954, **30**, 97–104. [Dept. Pharmacol., Karolinska Inst., Stockholm.]

The experimental diets were purified and contained all the amino-acids essential for the rat except phenylalanine, produced synthetically and given in the racemic form. Instead of phenylalanine the diets contained either 1.26 per cent. of the isopropyl ester of D- or L-phenylalanine or 2 per cent. of phenylalanine anhydride.

Both the esters were utilised as substitutes for phenylalanine, the L-ester giving slightly better growth than the D-. The anhydride gave results no better than the same diet without it.—D. Duncan.

3331

CAVALLINI, D. and TENTORI, L. **Metaboliti del triptofano nelle urine di ratto studiati mediante cromatografia su carta.** [Metabolites of tryptophan in the urine of rats studied by paper chromatography.] *Boll. Soc. ital. Biol. sper.*, 1953, **29**, 497–501. [Ist. Chim. Biol., Univ. Rome.]

Male rats weighing about 80 g. were maintained on a purified basal diet. In alternate periods of 2 days L-tryptophan was added to the diet. The urine was collected and analysed chromatographically on paper. The spots were examined for ultraviolet fluorescence and by the ninhydrin reaction.

Before administration of tryptophan there was no fluorescent spot on the paper, and only one spot reacting with ninhydrin, due apparently to glycine. The urine collected 24 and 48 hr. after administration of tryptophan gave 8 fluorescent spots and 3 reacting with ninhydrin. Only 3 were identified. One substance was L-kynurenine, another probably acetylkynurenine, and the third kynurenic acid; anthranilic acid and 3-hydroxyanthranilic acid were not present.—E. M. Hume.

3332

DALGLIESCH, C. E. and TEKMAN, S. **The excretion of kynurenine and 3-hydroxykynurenine by man.** *Biochem. J.*, 1954, **56**, 458-463. [Postgrad. Med. Sch., London, W.12.]

In about 100 samples of human urine a positive diazo reaction was always associated with the presence of hydroxykynurenine, confirmed by paper chromatography.

Hydroxykynurenine was excreted by 13 out of 31 patients with fever, without any other apparent common factor. It was not excreted in disorders associated with weight loss but no fever. Two normal men who received 10 g. DL-tryptophan by mouth excreted in the next 24 hr. both D- and L-kynurenine, but no hydroxykynurenine.

The mechanism involved in the different patterns of excretion is discussed.—D. Duncan.

3333

HARPER, A. E., MONSON, W. J., LITWACK, G., BENTON, D. A., WILLIAMS, J. N. (Jr.) and ELVEHJEM, C. A. **Effect of partial deficiency of threonine on enzyme activity and fat deposition in liver.** *Proc. Soc. Exp. Biol. Med.*, 1953, **84**, 414-417. [Dept. Biochem., Coll. Agric., Univ. Wisconsin, Madison.]

Rats were given for 2 weeks diets containing casein 9, sucrose 81.5, DL-methionine 0.3 and DL-tryptophan 0.1 per cent., maize oil, salts, choline and vitamins, with and without 0.36 per cent. threonine. Those on the threonine-deficient diet showed slow growth and greatly increased liver fat. The activities of the soluble liver enzymes xanthine oxidase and tyrosine oxidase and the endogenous oxygen uptake and CO₂ output were considerably less in homogenates from the deficient animals, and the activities of the mitochondrial enzymes succinic oxidase and choline oxidase were higher.

C. Warner.

3334

SCOTT, E. B. and SCHWARTZ, C. **Histopathology of amino acid deficiencies. 2. Threonine.** *Proc. Soc. Exp. Biol. Med.*, 1953, **84**, 271-276. [Dept. Anat., Sch. Med., Univ. S. Dakota, Vermillion.]

For part 1 see Abst. 5098, Vol. 21.

Male rats of mean bodyweight 100 g. were divided into 3 groups: 5 controls were fed to appetite on a complete synthetic diet containing 19 amino-acids; 9 others were given limited amounts of this ration on alternate days; the remaining 12 received to appetite a similar ration lacking threonine. After 45 days, all were killed except 2 deficient rats and 1 starved control, which were given a complete recovery diet for 45 days.

Rats in the control group were in every way normal and gained on the average 131 g. bodyweight. Deficient rats lost bodyweight, on the average 41 g. The testes were particularly atrophic, with no evidence of spermatogenesis, the tubules being composed principally of Sertoli cells resting on a basement membrane, sometimes with degenerating cells occupying the lumen. The interstitial cells were small and flat, and contained little cytoplasm. The epididymis was also atrophic, with sloughing seminiferous cells lying free within the lumen. The seminal vesicles and ventral prostates, also greatly atrophied, were in the castrate condition. The Golgi apparatus could not be demonstrated in the prostatic epithelium and there was a marked increase in prostatic interstitial tissue. The thyroid glands were small, but the follicular cells were normal in height, with the follicles themselves variable in size and colloid content. Of the pituitary only the anterior lobe was affected, the eosinophilic cells being conspicuously reduced in number, size and staining capacity, and gonadotropic basophilic cells positive to periodic acid Schiff being absent. There was atrophy but no change in structure of the adrenal glands and thymus, and considerable reduction in bone growth.

The rats given the recovery diet made uneventful and complete recoveries from the deficiency, and grew to the same average weight as the controls. The starved control rats lost on the average only 11 g. bodyweight, and although regression of some somatic tissues took place it was much less pronounced than that in the deficient animals. The pituitary was unaffected.

It is concluded that the primary effect of threonine deficiency was probably exerted on the eosinophilic and gonadotropic basophilic cells of the anterior lobe of the pituitary. In view of the normal histological appearance of the adrenal glands and the fact that only the so-called thyrotropic basophilic cells of the pituitary remained

undamaged, it is suggested that the hormone which activates the adrenal cortex has its source in these cells.—W. A. Greig.

3335

HAVERMANN, H. and SCHARPENSEEL, H. Untersuchungen über das Verhalten des d, l-Methionins im Stoffwechsel des vollwertig und nicht vollwertig ernährten Schweins und Legehuhns. Bilanz- und Verteilungsstudien mit d, l-³⁵S-Methionin. [Behaviour of dl-methionine in the metabolism of pigs and laying hens on complete and incomplete diets. Balance and distribution studies with dl-³⁵S-methionine.] *Arch. Tierernährung*, 1953, **3**, 259-280. [Inst. Tierzucht, Rheinisch Friedrich-Wilhelms-Univ., Bonn.]

Two pigs, 14 weeks of age, were maintained in metabolism cages; one received a diet containing animal protein and the other only vegetable protein. After 14 days each received daily 0.1 per cent. ³⁵S-methionine in the food, and faeces and urine were collected, at first every 6 hr. and then every 12 hr. for 5½ days. In this time two-thirds of the ³⁵S was excreted in the urine, mainly in inorganic form; about 20 per cent., mainly in organic form, was recovered in the faeces and about 15 per cent. was deposited in the tissues. These results were independent of whether the ration contained animal or only vegetable protein.

Two laying fowls received a normal mixed diet containing animal protein, a second pair a diet containing only vegetable protein, and a third pair this diet with 0.35 per cent. Aurofac (containing 4 g. aureomycin and 4 mg. vitamin B₁₂ per kg.). After a preliminary period each bird received by mouth methionine containing 0.4 mC. ³⁵S. In all the birds 91 to 94.5 per cent. of ³⁵S was recovered in the excreta; of this about 84 per cent. was in organic and 16 per cent. in inorganic form. In the tissues the greatest radio-activity was in the liver of the birds of group 3, next in those of group 2 and least in those of the group receiving animal protein. In 6 days the total recovery of ³⁵S in the eggs represented from 0.28 to 0.34 per cent. of the intake, the highest content being in eggs laid on the second to fourth days.

Autoradiographs of frozen slices of livers from the pigs and hens showed uniform distribution of ³⁵S through the tissue.—W. Godden.

3336

FORBES, R. M. and VAUGHAN, L. Nitrogen balance of young albino rats force-fed methionine- or histidine-deficient diets. *J. Nutrition*, 1954, **52**, 25-37. [Div. Animal Nutrit., Univ. Illinois, Urbana.]

Young albino rats were forcibly fed. In the first experiment the diet contained, per cent., oxidised

casein 18, maize oil 18, sucrose 28.8, starch 28.8, minerals and vitamins. In the other 2 experiments the N source was a mixture of amino-acids, the carbohydrate was all starch and the maize oil was reduced to 5 per cent. All diets were low in or devoid of methionine. In experiment 2 histidine also was absent. In experiment 3 the animals were kept for a 7-day pre-period on a N-free diet in order to deplete body stores of protein.

The results of all 3 experiments, which are partly at variance with the results of Denton *et al.* (Abst. 5392, Vol. 20) and of Bothwell and Williams (Abst. 5111, Vol. 21), show that under the experimental conditions the amino-acid deficiencies resulted in reduced N retention due to increased urinary excretion. When the animals were depleted of protein before receiving the diet free of methionine, N balance remained negative.

W. Godden.

3337

NIKLAS, A. and HEMPEL, K. Regeneration einzelner getrennter Serumproteinfractionen nach akutem Blutverlust. (Untersucht nach oraler Gabe von S³⁵-Methionin an Ratten.) [Regeneration of certain serum protein fractions after acute loss of blood, studied after oral administration of ³⁵S-methionine to rats.] *Ztschr. ges. exp. Med.*, 1953-54, **122**, 399-408. [Med. Klin., Univ. Cologne.]

Regeneration of serum protein fractions was studied in adult rats which had had about 30 per cent. of their blood drawn off by heart puncture half an hour before ³⁵S-methionine was given by stomach tube. Subsequently the ³⁵S-activity indicated no significant difference in serum protein synthesis between normal and bled rats.

M. B. Richards.

3338

WINGO, W. J., SMITH, R. A. and WOOD, J. The metabolism of dl-methionine sulfone by the rat. *Arch. Biochem. Biophys.*, 1953, **47**, 307-313. [Dept. Biochem., M. D. Anderson Hosp. Cancer Res., Houston, Tex.]

Methionine sulphone labelled with ³⁵S was given by intraperitoneal injection to adult rats. Most of the radio-activity was recovered in the organic S fraction of the urine within 24 hr. Paper chromatograms of the urine showed radio-activity in 4 spots, 2 corresponding to unchanged sulphone and inorganic sulphate, respectively; but most of the activity was found in substances which could be extracted from the urine with boiling butanol and purified by chromatography on wood cellulose. Paper chromatograms after hydrolysis with 6N HCl showed spots corresponding to methionine sulphone and glutamic acid. Treatment of the unhydrolysed material with nitrous fumes failed to show free amino-groups. It is suggested that

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the substance excreted was an open-chain peptide which became cyclic during extraction.

C. Warner.

3339

FELIX, K. and KREKELS, A. Die Endaminosäuren einiger Protamine. [The terminal amino-acids of some protamines.] *Hoppe-Seyler's Ztschr.*, 1953, **295**, 107-109. [Inst. Veg. Physiol., Univ. Frankfurt a.M.]

3340

STILLE, G. and WACHTER, H. P. Tierexperimentelle Untersuchungen über die Bedeutung der Purine als Leberschutzfaktoren. [Animal experiments on the importance of purines as liver-protecting substances.] *Ztschr. ges. exp. Med.*, 1953, **122**, 199-210. [Pharmakol. Abt., Nordmark-Werke GmbH Hamburg, Werk Uetersen, Holstein.]

Injections of liver hydrolysate (Prohepar) and

purines were given to mice before CCl₄ inhalation, to test their effectiveness in preventing liver damage. Histological examinations were supplemented by planimetric estimations of the extent of the necroses, and by measurement of the diameter of cell nuclei.

The liver hydrolysate was protective, surpassing adenine, xanthine and hypoxanthine. Apparently only the hydrolysate could give real protection to the liver cell nuclei. The mode of action of the substances is discussed.—M. B. Richards.

3341

HOFFMAN, W. S. Metabolism of uric acid and its relation to gout. *J. Amer. Med. Assoc.*, 1954, **154**, 213-217. [Hektoen Inst. Med. Res., Cook County Hosp., Chicago, Ill.]

A lecture report.

See also Absts. 3042, 3054, 3057, 3061, 3137, 3202, 3251, 3272, 3367, 3368, 3420, 3428, 3438, 3445, 3503, 3508, 3619, 3620, 3748, 3801, 4014.

FATS AND OTHER LIPIDS

3342

FERNANDES, J. De vetresorptie bestudeerd bij een kind met chylothorax. [Fat absorption studied in a child with chylothorax.] *Thesis*, Univ. Leyden, 1953, pp. 76. English summary.

Literature is reviewed, with special reference to the discordant theories of Verzár and Frazer on fat absorption. The study described was of a child with congenital chylothorax, admitted to hospital at 22 months of age. Chyle was removed weekly for 8 months. A standard diet was given of a preparation of buttermilk, rice flour and sugar, potato, green vegetable, lean meat, banana, orange juice, tomato juice, vitamins A, D, B complex and C, and Fe. The fat to be investigated was given emulsified in the milk or with the other foods. Total fatty acids and saturated fatty acids individually were estimated by Boldingh's methods (Abst. 46, Vol. 20) in the food, faeces and chyle weekly and once in blood. The child was in good health except for a short time on low-fat diet when he had an enteritic infection with steatorrhoea. The following fats were given, one at a time: butter, margarine, coconut fat and a synthetic fat consisting of 38 per cent. caprylic acid in olive oil, for the short-chain fatty acids; cocoa fat for fatty acids C₁₆ and C₁₈; a synthetic fat with hardened herring oil for fatty acids C₂₀ and C₂₂; sunflower seed oil and linseed oil for linoleic and linolenic acids; rape oil for erucic acid; olive oil for oleic acid, C₁₈ mono-ethylenic, *cis*-isomer, and olive oil with elaidic acid for elaidic acid, C₁₈ mono-ethylenic, *trans*-isomer.

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A table gives the comparison of chyle and food fat for each fat and the results are summarised in one diagram to show that the composition of the chyle changed from one fat to another but was approximately constant for a given fat. Saturated fatty acids C₄ and C₆ were not found in chyle, and C₈ only when caprylic acid was given in excess in olive oil. The percentage of fatty acids C₁₀, C₁₂, C₁₄ and C₁₆ recovered in chyle increased with the length of the carbon chain, and C₁₈ appeared to be better absorbed than C₁₆ if it was present only in small amount, but less well if present in large amount. The behaviour of C₂₀ and C₂₂ appeared to be similar but is not established. Oleic and elaidic acids were equally well absorbed. Unsaturated acids were uniformly well absorbed.

These results are explicable only if some hydrolysis of food fat occurs, *e.g.*, of butter, margarine and coconut fat; others may be absorbed without hydrolysis, *e.g.*, olive oil, sunflower seed oil, linseed oil and rape oil. Cocoa fat was poorly absorbed. The mechanics of absorption are not explained by these observations.—I. Leitch.

3343

SINGER, H., SPORN, J. and NECHELES, H. Fatty acid absorption and chylomicrons. *Science*, 1953, **118**, 723-724. [Dept. Gastro-Intestinal Res., Med. Res. Inst., Michael Reese Hosp., Chicago, Ill.]

Dogs with Thiry jejunal fistulae received 10 ml. oleic acid by mouth or introduced with or without Na taurocholate into the intestine. Chylomicron

counts were then made at once and 0.5, 1.0, 2.0, 3.0 and 4.0 hr. later.

Chylomicrons were present for about 3 hr. in all the experiments and were most numerous in the presence of bile salt.—G. A. Garton.

3344

JIMÉNEZ DÍAZ, C., MARINA, C. and ROMEO, J. M. **Studies on the mechanism of steatorrhoea.**

Bull. Inst. Med. Res. Univ. Madrid, 1953, **6**, 1-12. [Med. Clin., Univ. Madrid.]

See Abst. 762, Vol. 24.

3345

CULLEN, C. F. and SWANK, R. L. **Intravascular aggregation and adhesiveness of the blood elements associated with alimentary lipemia and injections of large molecular substances.** *Circulation*, 1954, **9**, 335-346. [Dept. Neurol., McGill Univ., Montreal.] Spanish summary.

Studies on hamsters showed that after a high fat meal of 2 to 15 g. per kg. bodyweight, changes occurred in the circulation which appeared after the peak of lipaemia was passed and developed to their maximum as the lipaemia cleared. There was increased adhesiveness and aggregation of red blood cells, and occasional clumping of platelets; the rate of circulation fell and at times there was complete cessation of blood flow. The changes were reversible, and after complete clearing of the lipaemia the circulation resumed a normal appearance. Similar circulatory changes were produced by injection of solutions of substances of large molecular weight, such as dextran, egg albumin and thromboplastin. When the circulatory changes were severe, as in all the hamsters which received dextran, pathological changes were found in the blood-brain barrier. The significance of these findings and their possible relation to multiple sclerosis and vascular thrombosis are discussed. A coloured cinephotomicrograph has been prepared showing the circulatory changes.

M. B. Richards.

3346

HEYMAN, W., MATTHEWS, L. W., LEMM, J., OLYNYK, P., SALEHAR, M. and GILKEY, C. **Fat metabolism in nephrotic hyperlipemia.** *Metabolism*, 1954, **3**, 27-31. [Dept. Paediat., Sch. Med., W. Reserve Univ., Cleveland, Ohio.]

Sixteen rats with nephrosis and high blood lipids and 15 control rats were given an intravenous injection of fat emulsion containing ^{14}C -labelled trilaurin. The fate of the administered fat was studied by collecting the expired CO_2 in a respirometer and estimating its ^{14}C content. Clearance of ^{14}C -trilaurin from the bloodstream of 5 nephrotic and 5 control rats was studied by direct counting of the radio-activity of dried blood samples taken

at intervals of 0.5, 1, 2, 3, 4, 6 and 8 hr. after the injection. The blood clearance of intravenously injected coconut oil emulsion in 22 nephrotic and 16 control rats was studied by direct estimation of total plasma lipids at intervals.

The specific activity of the respired CO_2 was low in 5 and normal in 11 nephrotic animals. Though these 5 rats failed to metabolise trilaurin normally, no correlation with the degree of lipaemia could be established and the finding is thought to be of doubtful significance. The blood clearance of radio-active trilaurin and of coconut oil proceeded at the same rate in nephrotic and normal animals.

It is concluded that the high blood lipids in nephrosis may be due to increased fat mobilisation rather than to faulty deposition or utilisation of lipids.—G. A. Garton.

3347

CUNNINGHAM, H. M. and LOOSLI, J. K. **The effect of fat-free diets on lambs and goats.** *J. Animal Sci.*, 1954, **13**, 265-273. [Cornell Univ., Ithaca, N.Y.]

Four weanling lambs fed on a fat-free diet showed no sign of essential fatty acid deficiency. Traces of linoleic and linolenic acids were present in the rumen, but their concentration declined as the experiment progressed. No arachidonic acid was detected in the rumen contents. As the lambs lost weight, it is possible that tissue stores were sufficient to prevent fat deficiency. No bacteria isolated from the rumen of a cow on a natural diet synthesised essential fatty acids when grown on fat-free media.

In the second trial 8 two-day-old lambs and 7 two-day-old goats were used. The lambs on fat-free synthetic milk died within 7 weeks, but those on the same milk with 2 per cent. lard were reared successfully. The kids on fat-free milk died within 3 weeks, those on the milk plus 0.25 per cent. lard or 0.36 per cent. linoleic acid survived. Kids on a diet containing 0.05 per cent. lard died.

J. C. Gill.

3348

KEHAR, N. D. **Food value of ghee, vanaspati and oils.** *Indian Farming*, 1954, **3**, 16-19. [Animal Nutrit. Div., Indian Vet. Res. Inst., Izatnagar.]

3349

MEAD, J. F., STEINBERG, G. and HOWTON, D. R. **Metabolism of essential fatty acids. Incorporation of acetate into arachidonic acid.** *J. Biol. Chem.*, 1953, **205**, 683-689. [Dept. Physiol. Chem., Sch. Med., Univ. California, Los Angeles.]

Seventeen weanling rats were given 3 daily intraperitoneal injections of Na $1\text{-}^{14}\text{C}$ -acetate and were killed on the 4th day. Lipids were extracted

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from the pooled kidneys, hearts, livers and abdominal fat deposits and then saponified to yield fatty acids, which were separated by Pb salt fractionation. Radio-activity of the fractions was estimated.

Acetate was not incorporated into linoleic acid to any appreciable extent, in confirmation of the work of Bernhard and Schoenheimer (Abst. 3565, Vol. 10). The arachidonic acid contained ^{14}C almost exclusively in the carboxyl group, showing that it was formed from a C_{18} precursor probably derived from linoleic acid.—G. A. Garton.

3350

THOMASSON, H. J. **Stearolic acid, an essential fatty acid?** *Nature*, 1954, **173**, 452. [Unilever Res. Lab., Zwijndrecht, Netherlands.]

Stearolic acid, Δ^8 -octadecynoic acid-1, did not improve survival time, tail lesions or growth of rats depleted of essential fatty acids.

G. A. Garton.

3351

KLEIN, P. D. and JOHNSON, R. M. **Changes with age in the unsaturated fatty acids content of subcellular particles of rat livers.** *Arch. Biochem. Biophys.*, 1954, **48**, 172-177. [Detroit Inst. Cancer Res., Mich.]

Male albino rats were fed from weaning on a commercial diet and groups of from 4 to 6 animals were killed at intervals between 1 and 16 months of age. Other rats were fed from weaning on another commercial diet containing more linoleic and linolenic acids than the first; from 4 to 6 animals were killed at ages between 6 and 20 months. The livers were removed and homogenised before fractionation into mitochondria, microsomes and a slightly sedimentable layer. Di-, tri-, tetra- and pentaenoic acids were estimated in each particulate fraction by the method of Herb and Riemenschneider (Abst. 66, Vol. 24).

No change occurred in polyunsaturated fatty acid concentration in the 3 particulate fractions up to the age of 11 months. After this the group which received the diet lower in unsaturated fatty acids showed higher concentrations of trienoic acids in the cytoplasmic particles, and a decline in pentaenoic acid. No change was found in preparations from animals which received the diet higher in unsaturated fatty acids.—G. A. Garton.

3352

MAYER, J. and ZIGHERA, C. Y. **The multiple etiology of obesity: production of two types of obesity in littermate mice.** *Science*, 1954, **119**, 96-97. [Dept. Nutrit., Harvard Sch. Pub. Health, Boston, Mass.]

Mice with obesity of genetic origin had high blood sugar levels which were raised higher by treatment with growth hormone. In obesity

induced by injection of gold thioglucose (see Waxler and Boecher, *Amer. J. Physiol.*, 1952, **162**, 428), even in littermates of genetically obese mice, the blood sugar was normal before and after treatment with growth hormone.

One unit of insulin produced convulsions in mice treated with gold thioglucose, but genetically obese mice were resistant.—D. Harvey.

3353

MAYER, J. and JONES, A. K. **Hypercholesteremia in the hereditary obese-hyperglycemic syndrome of mice.** *Amer. J. Physiol.*, 1953, **175**, 339-342. [Dept. Nutrit., Harvard Sch. Pub. Health, Boston, Mass.]

The obese mice were 4 to 5 months old and weighed from 45 to 60 g., and each was caged with a normal mouse weighing 20 to 30 g. They were fed on stock pellets or on one of the following diets: high-carbohydrate, containing sucrose 80.7, casein 10, maize oil 3, cod liver oil 2, salt mixture 4, cystine 0.2 and choline 0.1 per cent.; high-protein, with casein increased to 60 and sucrose reduced to 30.7 per cent.; and high-fat, containing lard 46, maize oil 5.9, cod liver oil 2, casein 39.4, salt mixture 6.3, cystine 0.25 and choline 0.15 per cent. B vitamins, menadione and α -tocopherol were supplied to all mice.

On stock diet the mean blood sugar in normal mice was 109 mg. per 100 ml., standard deviation ± 23 , and in obese mice 180 ± 77 . Serum cholesterol was 74 ± 14 and 134 ± 21 mg. per 100 ml., respectively.

On the high-carbohydrate diet the weight of obese and normal mice increased; in obese animals blood sugar and cholesterol values rose, the latter to 165 ± 30 , but in normals it fell to 55 ± 7 mg. per 100 ml. On the high-protein diet obese animals gained, but controls lost weight; blood sugar in obese mice rose from 131 ± 15 to 277 ± 135 mg. and cholesterol to 177 mg., but in normals cholesterol values were halved, falling to 34 ± 5 mg. per 100 ml. The high-fat diet produced a poor appearance in obese mice and one died; blood sugar rose in controls and fell in obese animals, and cholesterol was unchanged. Fasting for 18 to 20 hr. caused a sharp fall in the blood sugar of obese mice from 278 ± 29 to 114 ± 36 and a significant rise in serum cholesterol to 170 ± 7 mg. per 100 ml., but controls showed a slight fall in blood sugar and no change in cholesterol.

Growth hormone, 1 mg. daily, greatly raised blood sugar in obese mice and slightly raised serum cholesterol in obese and control animals. Thyroxine, 50 μg . daily, halved serum cholesterol in both groups, and obese mice lost weight. Adrenocorticotrophic hormone and diethylstilboestrol had little or no effect.

The high serum cholesterol values are considered to be an essential part of the hereditary syndrome of obesity and diabetes.—D. Duncan.

3354

BEAUVALLÉ, M. Le foie gras par action sur l'état nutritionnel. [**Fatty liver (caused) by action on the nutritional state.**] *Ann. Nutrit. Alimentation*, 1953, 7, C15-C36 (with discussion C36-C39.) [Lab. Physiol. Gén., Fac. Sci., Paris.]

A review.

3355

LÉVY, M. Les troubles du métabolisme précédant et accompagnant les stéatoses hépatiques. [**Metabolic disturbances preceding and accompanying fatty degeneration of the liver.**] *Ann. Nutrit. Alimentation*, 1953, 7, C315-C362 (with discussion C362). [C.N.R.S., Paris.]

3356

HÉDON, L. and MACABIES, J. Le foie gras par déséquilibres hormonaux. [**Fatty liver (caused) by hormonal imbalance.**] *Ann. Nutrit. Alimentation*, 1953, 7, C41-C80 (with discussion C80). [Lab. Physiol., Fac. Méd., Montpellier.]

A review.

3357

CLÉMENT, G. Composition chimique des foies gras. Répartition des lipides et stérols. [**Chemical composition of fatty livers. Distribution of lipids and sterols.**] *Ann. Nutrit. Alimentation*, 1953, 7, C267-C280 (with discussion C280-C281). [C.R.N.S., Paris.]

3358

LE BRETON, É. Étude de la stéatose hépatique à l'échelle cellulaire. [**Study of fatty liver with reference to cell structure.**] *Ann. Nutrit. Alimentation*, 1953, 7, C363-C404. [Dept. Physiol., Inst. Recherches Cancer, C.N.R.S., Paris.]

3359

BERNHARD, K. Les facteurs lipotropes. [**Lipotropic factors.**] *Ann. Nutrit. Alimentation*, 1953, 7, C235-C265 (with discussion C265). [Univ. Basle.]

3360

HARPER, A. E., MONSON, W. J., BENTON, D. A., WINJE, M. E. and ELVEHJEM, C. A. **Factors other than choline which affect the deposition of liver fat.** *J. Biol. Chem.*, 1954, 206, 151-158. [Dept. Biochem., Coll. Agric., Univ. Wisconsin, Madison.]

Groups of 6 weanling rats were fed to appetite. The basal diet consisted of sucrose 81.6, casein 9.0,

DL-methionine 0.3, maize oil 5, salts 4 and choline chloride 0.13 per cent., with vitamins. Supplements, replacing an equal weight of sucrose, included gelatine, DL-threonine, DL-tryptophan, glycine, serine, choline, betaine, cystine, mixtures of ketogenic amino-acids, thiocetic acid, pantethine, maize oil and butterfat, individually or in combination. After 2 weeks the animals were killed and liver fat was estimated.

The results show that the amount of liver fat in young rats receiving choline depends on the interaction of several substances, though threonine was found to be particularly effective in reducing fat deposition. Tryptophan reduced the effectiveness of threonine. Although betaine, glycine and serine were each only partly effective in preventing deposition of liver fat, combinations of these amino-acids were almost as effective as threonine. Threonine was not effective in the absence of choline. Fat did not accumulate progressively in the livers of animals which received increasing amounts of dietary fat.

It is suggested that threonine, and probably other essential amino-acids, may be required for the formation of an enzyme or enzymes necessary for normal liver metabolism.—G. A. Garton.

3361

DUCHESNE, D. D. and BERNARD, R. **Further studies on lipotropism in the domestic duck (White Pekin).** *Canad. J. Med. Sci.*, 1953, 31, 474-484. [Dept. Biol., Laval Univ., Quebec.]

Supplementing a choline-free diet containing 10 per cent. casein with 0.5 per cent. methionine raised the level of liver lipids in ducklings, but the supplement had no effect when the diet contained 18 per cent. casein, and with 28 per cent. casein it was lipotropic. When a purified soya bean protein, low in methionine, was used in place of casein, at levels of 12, 21.7 and 27.9 per cent., there was no difference in liver lipids, but methionine was lipotropic at all and especially at the higher protein levels. It was concluded that soya bean protein is not lipotropic, that casein is lipotropic, and that the lipotropic activity of methionine is closely related to the quality and quantity of the protein in the diet.

Diets high in fat produced high levels of liver lipids, but were less lipogenic than diets rich in carbohydrates. Choline had no lipotropic effect with diets containing 22 to 42 per cent. fat, but was strongly lipotropic with fat-free diet, even one supplemented with 1 per cent. cholesterol. Inositol was also lipotropic under these conditions, though less so than choline. The actions of both choline and inositol were evident primarily on the glyceride fraction, and were synergistic.

W. A. Greig.

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3362

HALL, C. E. and BIERI, J. G. **Modification of the choline deficiency syndrome in the rat by somatotrophin and hydrocortisone.** *Endocrinology*, 1953, **53**, 661-666. [Carter Physiol. Lab., Univ. Texas Med. Branch, Galveston.]

Anterior pituitary growth hormone increased the incidence of kidney lesions in young rats on a choline-deficient diet. Hydrocortisone prevented these lesions, but appeared to replace them by others. Neither substance prevented the development of fatty livers.—D. Duncan.

3363

CASSELMAN, W. G. B. and WILLIAMS, G. R. **Choline deficiency in the guinea pig.** *Nature*, 1954, **173**, 210-211. [Banting and Best Dept. Med. Res., Univ. Toronto.]

Deposition of fat in the form of fine droplets in the centrilobular cells was observed in the livers of guineapigs fed on a choline-deficient diet. The difficulty of producing signs of choline deficiency in guineapigs is discussed.—D. Duncan.

3364

HELLMAN, L., ROSENFELD, R. S. and GALLAGHER, T. F. **Cholesterol synthesis from C¹⁴-acetate in man.** *J. Clin. Invest.*, 1954, **33**, 142-149. [Div. Phys. Biophys., Sloan-Kettering Inst. Cancer Res., New York 21.]

Acetate labelled with ¹⁴C was given by mouth to 6 hospital patients with limited expectancy of life. Blood samples were taken at intervals up to 43 days afterwards for estimation of the ¹⁴C content of the free and ester cholesterol in the plasma.

The highest specific activity of free cholesterol was found within 8 hr., followed by a gradual decline. The maximum specific activity of ester cholesterol was not reached until 2 days after the labelled acetate was given, and then it declined at a rate similar to that of free cholesterol. A minimum of 3 per cent. of the acetate was incorporated into plasma cholesterol.—G. A. Garton.

3365

SWELL, L., FLICK, D. F., FIELD, H. (Jr.) and TREADWELL, C. R. **Influence of dietary bile salts on blood cholesterol levels.** *Proc. Soc. Exp. Biol. Med.*, 1953, **84**, 428-431. [Veterans Admin. Centre, Martinsburg, W. Va.]

After being reared on stock diet, 45 rats in 7 groups received to appetite a basal diet with percentage composition casein 20, starch 23, glucose 23, olive oil 25, salt mixture 5, ruffex 2 and cholesterol 2, with crystalline vitamins. Individual groups received for 21 days 1 per cent. cholate, taurocholate, deoxycholate or dehydrocholate and one group received in succession dehydrocholate

for 7 days, taurocholate 7 days and dehydrocholate 5 days.

Total blood cholesterol increased in all groups after a week; it was not significantly higher with dehydrocholate than without bile salt, but cholate, taurocholate and deoxycholate gave increases 41.1, 36.9 and 16.5 per cent. greater, respectively, than the diet without bile salt. When the bile salts were given in succession dehydrocholate at first had no effect, but after the blood cholesterol was raised by taurocholate it was reduced by dehydrocholate. No toxic effect was detected.

The relation of bile salts to blood cholesterol is discussed.—D. Duncan.

3366

SHERBER, D. A. and LEVITES, M. M. **Hypercholesterolemia: effect on cholesterol metabolism of a polysorbate 80-choline-inositol complex (Monichol).** *J. Amer. Med. Assoc.*, 1953, **152**, 682-686. [Metabol. Res. Lab., Fordham Hosp., New York.]

Of 960 patients admitted consecutively to the medical services of Fordham Hospital, 131 (13.7 per cent.) had serum cholesterol values above 300 mg. per 100 ml., and of these 91 had cardiovascular disease and 27 diabetes. The incidence of high blood cholesterol values between ages 30 and 80 rose with age, and between 40 and 70 years high blood cholesterol was commoner in women than in men.

Preliminary trials showed that neither a 30 per cent. aqueous solution of polysorbate 80 nor a mixture of choline, inositol and methionine was effective in reducing serum cholesterol, but that significant reduction was obtained with a mixture containing 500 mg. polysorbate 80, 500 mg. choline dihydrogen citrate and 250 mg. inositol per 5 ml. In a more extended trial with 16 patients, 15 responded to 20 ml. daily of this mixture given in 4 doses. There was a simultaneous rise in urinary cholesterol.

It is suggested that the mechanism of reduction of serum cholesterol is related to adrenal cortical function. More extensive studies are in progress. [Some of the tables are not reproduced but are given in authors' reprints.]—W. M. Deans.

3367

FILLIOS, L. C. and MANN, G. V. **Influence of sulfur amino-acid deficiency on cholesterol metabolism.** *Metabolism*, 1954, **3**, 16-26. [Dept. Nutrit., Harvard Sch. Pub. Health, Boston, Mass.]

Groups of mice and rats were fed for several weeks on diets containing soya bean protein or casein with and without the addition of cholesterol. For some the soya bean protein diet was supplemented with DL-methionine. Blood cholesterol

was estimated from time to time, and at the end of the rat experiments their liver lipids were fractionated for estimation of phospholipins and total and free cholesterol.

The experimental diets which included cholesterol caused a rise of serum cholesterol, especially in the animals given soya bean protein; the high serum cholesterol fell when DL-methionine also was included in the diet. Animals given soya bean protein without cholesterol lost appetite, and it was not improved by methionine. No consistent relation between liver and serum cholesterol was found in the rats with high serum cholesterol. No arteriosclerosis was seen in these short experiments.

G. A. Garton.

3368

LINARES GADEA, L. D. Acción de la metionina y colina sobre la colesterolemia. [Effect of methionine and choline on blood cholesterol.] *An. Fac. Farm. Bioquim., Lima*, 1952, **3**, 389-395. [Lab. Bioquim. Esp., Univ. Lima.] Experiments with rabbits.

3369

FRANTZ, I. D. (Jr.), SCHNEIDER, H. S. and HINKELMAN, B. T. Suppression of hepatic cholesterol synthesis in the rat by cholesterol feeding. *J. Biol. Chem.*, 1954, **206**, 465-469. [Cardiovascular Res. Lab., Dept. Med., Harvard Med. Sch., Boston, Mass.]

Male rats were used, some of which had previously had their thyroid glands damaged by the administration of radio-active I. Groups of these animals were fed on a diet of Purina chow with or without the addition of 1 per cent. cholesterol, and were killed at intervals up to 5 weeks. Blood and liver cholesterol were estimated and liver slices were incubated for 3 hr. with ^{14}C -carboxyl-labelled acetate. Cholesterol was isolated from the incubation medium and its radio-activity was measured.

Serum cholesterol values of rats with damaged thyroids were slightly higher than those of normal animals, even on the diet without cholesterol. When cholesterol was included in the diet, the rise in serum cholesterol was greater than in the animals with normal thyroids. Liver cholesterol rose to the same extent after the administration of cholesterol in both normal rats and those with damaged thyroids.

Formation of cholesterol from acetate was inhibited to at least as great an extent in animals which had received radio-active I as in normal rats.

G. A. Garton.

3370

ROSENMAN, R. H., BYERS, S. O. and FRIEDMAN, M. The effect of dihydrocholesterol on the absorption of cholesterol by the rat. *Circulation Res.*, 1954, **2**, 45-47. [Harold Brunn Inst., Mount Zion Hosp., San Francisco, Calif.]

Male rats with thoracic duct cannulae were given by stomach tube 100 mg. cholesterol with or without 100 mg. dihydrocholesterol. When dihydrocholesterol was given with the cholesterol the amount of cholesterol found in the lymph in the subsequent 24 hr. was only 63 per cent. of that found when cholesterol was given alone.

Rats were fed on a stock diet to which were added 2 per cent. cholesterol and 1 per cent. cholic acid to induce a high blood cholesterol level; 1 group received also 2 per cent. dihydrocholesterol. Blood samples were taken for total and ester cholesterol estimation at intervals of 2 weeks during 2 months. The addition of dihydrocholesterol slowed down the development of high blood cholesterol and reduced its intensity.

G. A. Garton.

3371

HERNANDEZ, H. H., CHAIKOFF, I. L., DAUBEN, W. G. and ABRAHAM, S. The absorption of C^{14} -labeled epicholesterol in the rat. *J. Biol. Chem.*, 1954, **206**, 757-765. [Dept. Physiol., Sch. Med., Univ. California, Berkeley.]

Twelve rats had cannulae in the thoracic lymph ducts. Of these, 6 received by stomach tube 1 mg. ^{14}C -labelled cholesterol dissolved in 0.25 ml. maize oil and the other 6 received 1 mg. ^{14}C -labelled epicholesterol, the 3- α -hydroxy-isomer of cholesterol. Intestinal lymph was then collected at intervals for estimation of free and combined sterol and measurement of their radio-activity.

Cholesterol was more rapidly absorbed than epicholesterol and ^{14}C recoveries from the lymph of rats given cholesterol were about twice those found in rats given epicholesterol. About 50 per cent. of the cholesterol recovered was esterified, but almost no epicholesterol was found in ester combination. Esterification may be responsible for the difference observed in the rates of absorption of the 2 stereo-isomers.—G. A. Garton.

3372

YOSHIHARA, M. [Biochemical studies on the compound lipids. 11. On the rat's organ plasmalogen in the various dietary fatty livers.] *Sapporo Med. J.*, 1953, **4**, 75-78. [Dept. Biochem., Sapporo Univ. Med.] In Japanese: English summary.

Fatty livers were produced in rats by low-protein and high-fat, high-cholesterol or raw liver diets. Neutral fat was from 3 to 11 times the normal, but only in the animals receiving raw liver was the plasmalogen content increased, and that tenfold. (From summary.)—D. Harvey.

3373

McKIBBIN, J. M. and BREWER, D. W. Effect of inositol feeding on inositol phosphatides and

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other lipids of human blood plasma. *Proc. Soc. Exp. Biol. Med.*, 1953, **84**, 386-388. [Dept. Biochem., Coll. Med. State Univ. New York, Syracuse.]

Thirteen patients aged from 34 to 68 years showed different degrees of high-tone deafness, supposed to be associated with arteriosclerosis. Blood samples were taken before and after inositol treatment, 1 g. inositol being given by mouth 3 times daily for from 1 to 12 months.

No significant change occurred in plasma inositol phosphatides, and increases in total and free cholesterol and total phospholipins were of doubtful statistical significance. There was an apparent decrease in neutral fat, especially in patients with cholesterol values above 200 mg. per 100 ml.

D. Duncan.

3374

JONES, R. J., KRAFT, S. C., HUFFMAN, S., BALTER, E. L. and GORDON, R. B. **The effect of a cholesterol-free brain fraction against diet-induced atherosclerosis.** *Circulation Res.*, 1953, **1**, 530-533. [Dept. Med., Univ. Chicago, Ill.]

Four groups of twelve 10-week old cockerels were given chicken mash mixed with 8 per cent. cottonseed oil and 1 per cent. cholesterol, alone or with a crude lipid-poor brain powder, such as was used in earlier experiments (Abst. 4676, Vol. 23), added at the rate of 5, 10 or 15 g. per 100 g. After 5 weeks the birds were killed and evidence of arteriosclerosis was assessed macroscopically by the system of Dauber *et al.* (Abst. 3739, Vol. 19), as well as by microscopic examination.

Grossly and microscopically the lesions were progressively less severe as the supplement of brain powder increased in amount. The powder's active component is thought to be a cerebroside, but its high protein content may also affect the

serum cholesterol or the occurrence of arteriosclerosis.—D. Harvey.

3375

COOK, D. L., MILLS, L. M. and GREEN, D. M. **The mechanism of alloxan protection in experimental atherosclerosis.** *J. Exp. Med.*, 1954, **99**, 119-124. [Div. Biol. Res., G. D. Searle and Co., Chicago, Ill.]

Of 3 groups of rabbits, one consisted of controls, the second of animals rendered diabetic by injections of alloxan and the third of rabbits which had been given alloxan but in which the pancreas had, during the period of alloxan absorption, been occluded from the circulation and protected from its action. Several weeks later all groups were given to appetite Rockland rabbit ration with 1 per cent. cholesterol added. Food consumption was measured and at the end of 8 weeks the animals were killed.

When compared with the other groups the diabetic animals were found to have consumed significantly greater quantities of food and to have significantly higher values for serum cholesterol and lipoproteins of S₁ 5 to 9 and 16 to 30 classes; the degree of arteriosclerosis was not significantly different. The alloxan-protected rabbits were similar to the controls. In its effect on tissues other than the pancreas alloxan gives no protection against arteriosclerosis produced by cholesterol.—D. Harvey.

3376

ALTSCHUL, R. **Influence of ultraviolet irradiation on cholesterol arteriosclerosis in rabbits.** *Circulation Res.*, 1953, **1**, 185. [Univ. Saskatchewan, Saskatoon.]

See also Absts. 3096, 3179, 3200, 3249, 3281, 3302, 3370, 3389, 3441, 3445.

MINERALS

GENERAL

3377

BLOMHERT, G. Grondbeginselen van de huis-houding van water en electrolyten. [**Elements of the metabolism of water and electrolytes.**] *Nederland. Tijdschr. Geneesk.*, 1954, **98**, 429-446.

A review.

3378

WILSON, G. M., EDELMAN, I. S., BROOKS, L., MYRDEN, J. A., HARKEN, D. E. and MOORE, F. D. **Metabolic changes associated with mitral valvuloplasty.** *Circulation*, 1954, **9**, 199-219. [Dept. Surg., Peter Bent Brigham

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Hosp., Harvard Med. Sch., Boston, Mass.] Spanish summary.

Patients with mitral stenosis present abnormalities of water and electrolyte metabolism, shown in balance and isotope dilution studies. There is excess of Na and water in the body, without oedema, and associated with low K and chronic wasting. The changes after operation are those characteristic of severe surgical measures in general, but are greater than usual.—I. Leitch.

3379

ROHAN, P. Příspěvek k otázce minerálního metabolismu u tuberkulózy a při léčení tuberkulózy kyselinou p-aminosalicylovou (PAS). [**Mineral**

metabolism in tuberculosis and in *p*-aminosalicylic acid (PAS) treatment.] *Scripta med.*, 1953, **26**, 33-64. [Inst. Exp. Pathol., Med. Fac., Masaryk Univ., Brno.] English and Russian summaries.

Na, K, Cl and Ca were estimated in the sera of 42 tuberculous patients before and during treatment with sodium PAS and on the fourth day after interrupting it. No characteristic change was found, and the findings of other authors of K deficiency in tuberculous patients treated with PAS were not supported. The mineral metabolism of these tuberculous patients was influenced neither by PAS treatment nor by its cessation.—M. Prokšová (Czechoslovakia).

See also Absts. 3224, 3296, 3300, 3388.

CALCIUM AND PHOSPHORUS

3380

BREWER, W. D., CEDERQUIST, D. C., COLE, B., TOBEY, H., OHLSON, M. A. and STRINGER, C. J. **Calcium and phosphorus metabolism of women with active tuberculosis.** *J. Amer. Dietetic Assoc.*, 1954, **30**, 21-24. [Dept. Foods Nutrit., Michigan State Coll., East Lansing.]

The 6 women chose their diets from the foods served to them in hospital. After 2 weeks' observation on customary hospital diet their milk intake was restricted to 300 g. daily for 2 periods and then increased to 1200 g. daily for 2 periods. Each period consisted of 14 days of dietary adjustment followed by a 7-day balance study.

A supplement of 5 mg. riboflavin given during periods 2 and 4 had no effect on Ca and P retentions. From the regression of Ca intake on retention, equilibrium was predicted at an intake of 1.22 g., which is higher than is usually predicted for healthy women. The intake of P required for equilibrium was predicted to be 1.38 g. per day, which is not significantly different from values for healthy women reported in the literature.

F. C. Aitken.

3381

HANSARD, S. L., COMAR, C. L. and PLUMLEE, M. P. **The effects of age upon calcium utilization and maintenance requirements in the bovine.** *J. Animal Sci.*, 1954, **13**, 25-36. [Univ. Tennessee-Atomic Energy Commission Agric. Res. Program, Oak Ridge.]

Thirty-four Hereford cattle were used, in age from 10 days to 190 months. The calves aged 10 and 30 days received fresh milk and the older animals balanced rations for 2 to 6 months before the balance trials. Chemical and radio-active balance studies were made for 7 days after each received a single dose of ^{45}Ca by mouth or intravenously.

The percentage of total Ca intake excreted in the faeces increased from 7.2 ± 3 at 10 days to 82 ± 12 at 2 years, 103 ± 10 in mature and 128 ± 14 in aged cattle. Even when the old cows received large supplements of Ca they remained in negative balance. By the method reported earlier (Title 3816, Vol. 21) it was estimated that true absorption was 99 per cent. of the intake at 10 days, 34 per cent. in adult and 22 per cent. in aged cows. Retention was 91, 28 and 16 per cent., respectively, and of the faecal Ca 3, 33 and 45 per cent. came from the body stores. The difference between apparent and true digestibility increased with age. Maintenance requirements, based on the endogenous faecal Ca and the true digestibility, were estimated as 0.55 g. per 100 lb. bodyweight daily at 10 days and 2.0 g. from 6 months to maturity.

D. Duncan.

3382

LONTIE, P. Comment se distribue dans le squelette le radiocalcium administré au lapin adulte. **[Distribution in the skeleton of radio-active calcium administered to the adult rabbit.]** *Rev. belg. Pathol. Méd. exp.*, 1953, **23**, 118-125. [Inst. Anat., Univ. Louvain.] English summary.

Adult rabbits on a mixed diet received a single intraperitoneal injection of 1.1 mg. Ca as chloride containing 71 mC. ^{45}Ca , and were killed from 1 to 226 days later. The proportional distribution of radio-activity in the long bones did not change significantly during about 200 days.—W. Godden.

3383

LOFGREEN, G. P. and KLEIBER, M. **Further studies on the availability of phosphorus in alfalfa hay.** *J. Animal Sci.*, 1954, **13**, 258-264. [Dept. Animal Husb., Univ. California, Davis.]

For method see Abst. 5144, Vol. 23. Balance trials were made with 4 yearling wethers fed on the same alfalfa hay as in the previous experiment. Each sheep received a single subcutaneous injection of sodium phosphate containing 4.5 mC. ^{32}P .

The peak concentration of ^{32}P , expressed as mC. ^{32}P per g. total P, occurred in the plasma on the first day and in the faeces one day later. The specific activity of the urine was not a true measure of plasma concentration. From the fourth day onwards there was a close correlation between plasma and faecal activity and from the seventh to the thirteenth day the relation was linear. The metabolic P content of the faeces could be estimated from the activity of blood samples on the seventh and thirteenth days and of faeces from the eighth to the fourteenth day.

In the hay used the average true digestibility of P was 94 per cent. and the average metabolic P content of the faeces was 92 per cent.—D. Duncan.

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3384

ENNOR, A. H. and ROSENBERG, H. **An investigation into the turnover rates of organophosphates. 1. Extracellular space and intracellular inorganic phosphate in skeletal muscle. 2. The rate of incorporation of ^{32}P into adenosine triphosphate and phosphocreatine in skeletal muscle.** *Biochem. J.*, 1954, **56**, 302-308; 308-316. [Dept. Biochem., John Curtin Sch. Med. Res., Australian Nat. Univ., Canberra.]

3385

WOJTA, H. Beitrag zum Phosphorstoffwechsel in Knochentransplantaten. Eine experimentelle Studie mit Verwendung des radioaktiven Isotops P^{32} . [Phosphorus metabolism in bone transplants. An experimental study with the radio-active isotope ^{32}P .] *Langenbecks Arch. klin. Chirurg.*, 1953, **277**, 394-416. [Chirurg. Klin., Johannes-Gutenberg-Univ., Mainz.]

3386

GILLIS, M. B., NORRIS, L. C. and HEUSER, G. F. **Studies on the biological value of inorganic phosphates.** *J. Nutrition*, 1954, **52**, 115-125. [Agric. Exp. Stat., Cornell Univ., Ithaca, N.Y.]

Chicks were fed from day-old to 4 weeks on a purified diet low in P and Ca. A specially prepared sample of β -tricalcium phosphate or other supplement was added to give a total of 0.20, 0.25, 0.30 and 0.35 per cent. P in the diet. The ash content of the fat-free tibia was estimated at 4 weeks. The Ca:P ratio was adjusted to 2:1 by adding calcium carbonate. The biological value or availability of the phosphate supplements was compared with that of β -tricalcium phosphate.

Bone products, defluorinated rock phosphate and feed grade dicalcium phosphates all gave high values, raw rock phosphates gave moderate to low values, and most pyrophosphates and metaphosphates were unavailable to the animal.

R. Hill.

3387

NOZAKI, H., HORII, S., TAKEI, Y., HASHIZUME, T., MORIMOTO, H. and KAISHIO, Y. [On the accumulation process of phosphorus compounds in hen's egg.] *Bull. Nat. Inst. Agric. Sci., Chiba, Japan [G]*, 1953, No. 7, 161-168. In Japanese: English summary.

Two laying hens received 75 μC . ^{32}P as phosphate by mouth and the first 7 eggs collected from each hen were analysed. Radio-activity, mainly in the shell, was detected in the first eggs laid, within 26 hr. In the second eggs laid, after 72 to 76 hr., the total activity had increased about tenfold and was mostly in the yolk. Activity in the yolk reached its peak in the fourth eggs, but was

still appreciable in the seventh eggs laid after 9 to 10 days. Of the ^{32}P administered 6.3 to 7.8 per cent. was recovered in the 7 eggs produced in 10 days and of this 90 per cent. was in the yolks, mostly in the phosphatide and protein fractions.

Five eggs were collected over 7 days from each of 2 other hens after a similar dose of ^{32}P by mouth and the yolks of the eggs were submitted to more detailed analysis. Maximum activity in the yolk was found in the fourth eggs and ^{32}P appeared earlier in the protein than in the fat. The percentages of the total ^{32}P activity found in the yolk as lipoprotein were from 41.18 in the first egg to 76.16 in the fourth, as combined phosphatide from 22.56 in the first egg to 0.40 in the fifth, as cephalin from 2.01 in the second egg to 8.34 in the fourth and as lecithin from 4.53 in the second egg to 33.12 in the fifth. (From summary.)

W. Godden.

See also Absts. 2950, 2951, 3205, 3207, 3244, 3245, 3293, 3454, 3486-92, 3494, 3823.

SODIUM, POTASSIUM, AND SODIUM CHLORIDE

3388

WARNER, G. F., SWEET, N. J. and DOBSON, E. L. **"Sodium space" and body sodium content, exchangeable with sodium 24 , in normal individuals and patients with ascites.** *Circulation Res.*, 1953, **1**, 486-490. [Dept. Physiol., Univ. California Sch. Med., San Francisco.]

3389

BLAINEY, J. D., COOKE, W. T., QUINTON, A. and SCOTT, K. W. **The measurement of total exchangeable potassium in man, with particular reference to patients with steatorrhoea.** *Clin. Sci.*, 1954, **13**, 165-176. [Dept. Med., Univ. Birmingham.]

The technique of isotope dilution with radio-active K and the method of calculation of the total exchangeable K are described and the technical errors are discussed.

The subjects were 24 controls, 12 patients with steatorrhoea and 11 in whom electrolyte depletion was expected. Equilibrium between the radio-active isotope and the ^{39}K of the body was reached in the control subjects in about 18 hr. after the test dose of radio-active K, but in the patients with steatorrhoea not for 30 hr. In the control group 17 males had a mean exchangeable K of 3016 m. equiv., ± 191 (S.E.), and 7 females one of 2411 ± 141 . In contrast the 6 male and 6 female patients with steatorrhoea had mean exchangeable K values of 1940 ± 242 and 1355 ± 80 m. equiv.; these values are significantly lower than those of the controls, but when expressed in terms of exchangeable K per kg. bodyweight or per sq. m.

body surface there is no significant difference. Administration of K supplements caused K retention in patients with steatorrhoea.

The results are considered to indicate a state of K depletion in steatorrhoea.—L. Wills.

3390

FOURMAN, P. **Depletion of potassium induced in man with an exchange resin.** *Clin. Sci.*, 1954, **13**, 93-110. [Nuffield Dept. Clin. Med., Oxford.]

The clinical and biochemical findings when K deficiency was induced in 3 experiments on 2 normal subjects are described. The loss of K induced by the ammonium form of the resin in 2 experiments was 28 per cent. of total body K; this was greater than the loss induced by the hydrogen form. Loss of water and phosphate from cells was less than K loss. While the resin was being given Na, Mg and Ca were not retained in place of K. Loss of K was accompanied by extracellular acidosis and a deficit of N.

Severe K depletion caused the subjects to become mentally confused and they suffered from weakness, anorexia and apathy.—F. C. Aitken.

3391

ROSENMAN, R. H., FREED, S. C., ST. GEORGE, S. and SMITH, M. K. **Effect of varying dietary potassium upon the blood pressure of hypertensive rats.** *Amer. J. Physiol.*, 1953, **175**, 386-388. [Harold Brunn Inst., Mount Zion Hosp., San Francisco, Calif.]

For earlier work see Abst. 729, Vol. 21.

The right kidney was removed from male rats aged 4 to 5 weeks, and a figure-of-eight ligature was placed around the left kidney. After 6 weeks 76 rats were selected as having systolic blood pressures consistently above 140 mm. Hg. A group of 47 of these received a diet providing only 0.006 per cent. K, 11 others received the same diet with KCl to give 0.03 per cent. K, and 18 the same diet with a K content equal to that of the stock ration, 0.3 per cent. Blood pressures were recorded weekly for 8 weeks, after which most of the rats were killed for estimation of K in the serum, heart and skeletal muscle.

Only the severely depleted rats lost weight. The average blood pressure in this group was initially 166 mm. Hg, range 140 to 220, and finally 129 mm., range 90 to 160. The corresponding averages in the slightly depleted group were 170 and 146, and in the control group the average rose from 164 to 184 mm.

At the end of the experiment the average serum K was 3.1 m. equiv. per litre in the first group, and 4.6 and 4.5 in the second and control groups, respectively. Similarly, myocardial K was reduced to 79, range 57 to 95, in the first group, but

not significantly reduced in slight depletion, at 84, 80 to 89, compared with the control level of 87, 81 to 96. In skeletal muscle, K concentration was reduced in both depleted groups to about the same extent.—D. Duncan.

3392

GREEN, D. M., JOHNSON, A. D., BRIDGES, W. C. and LEHMANN, J. H. **Stages of salt exchange in essential hypertension.** *Circulation*, 1954, **9**, 416-424. [Sch. Med., Univ. S. California, Los Angeles.] Spanish summary.

Observations were made of the salt and water excretion of 79 patients on self-regulated intakes of these substances. Patients with high blood pressure could be divided into those with high and those with normal Na excretion. The former were characterised by high output of salt and water, both under basal conditions and under saline or mannitol loads, an increased appetite for salt and a nearly normal glomerular filtration rate in spite of reduced plasma flow. The second group had a relatively normal output of salt and water, both under basal conditions and under load, a normal appetite for salt, and a low glomerular filtration rate and renal plasma flow. The mean cardiac output did not differ significantly in the 2 groups. The findings are interpreted to indicate that high salt excretion represents an early stage of hypertensive disease and normal salt excretion a later stage. The patterns of salt exchange in human hypertension resemble those in experimental corticoid and renal hypertension.

M. B. Richards.

3393

WILHELMJ, C. M., MEYERS, V. W., MILANI, D. P. and MCCARTHY, H. H. **Effect of sodium chloride upon the blood pressure of normal dogs when administered during dietary stress.** *Amer. J. Physiol.*, 1954, **176**, 86-88. [Dept. Physiol., Sch. Med., Creighton Univ., Omaha, Nebr.]

Stress was produced in 3 dogs by diets rich in carbohydrate without or with salt in amounts of 25, 40 or 50 g. daily given after prolonged fasting. Such re-feeding without salt caused a large increase in systolic pressure but the addition of salt later produced negligible changes. When the diet and salt were given simultaneously the effect in increasing systolic pressure was similar to that found by Wilhelmj *et al.* (Title 3827, Vol. 21) with unfasted dogs. Diastolic pressure was usually unaffected.

Substitution of isocaloric amounts of raw horse meat in the carbohydrate diet caused a reduction in the systolic pressure (Title 3272, Vol. 24) unaffected by the presence or absence of salt.

D. Harvey.

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3394

RICHTER, C. P. and MOSIER, H. D. (Jr.). **Maximum sodium chloride intake and thirst in domesticated and wild Norway rats.** *Amer. J. Physiol.*, 1954, **176**, 213-222. [Dept. Psychiat., Johns Hopkins Sch. Med., Baltimore, Md.]

The 36 wild rats trapped shortly before the experiment began were compared with 36 Norway rats bred in the laboratory. The stock diet contained 5 per cent. salt butter and 1 per cent. NaCl; in the low-salt diet saltless butter was used and NaCl was omitted. Twelve groups of 3 rats of each strain received the low-salt diet alone or with from 2 to 70 per cent. of added salt until they died or until they were killed after from 72 to 92 days.

All the rats receiving 25 per cent. or less NaCl were healthy after from 89 to 92 days except one domesticated and 2 wild rats. With 35 per cent. NaCl 1 wild and 2 domesticated rats died and the other 3 were moribund when killed after 42 days. All the rats receiving 50 or 70 per cent. NaCl died; one domesticated rat survived 17 days on 70 per cent. NaCl. The rats learned to eat as much of the high-salt as they had previously eaten of the low-salt diet, except at the 2 highest salt concentrations. At 35 per cent. NaCl the salt intake was 23 g. per kg. bodyweight daily. Water intake increased abruptly and was then kept almost constant; the highest consumption was in rats on 25 per cent. NaCl. Both before and during the experiment the wild rats drank more than the domesticated rats, and the increases in water intake, except at 25 per cent. NaCl, were greater both absolutely and relatively to their pre-experimental intakes. The domesticated rats needed about 60 g. water per g. NaCl to maintain health. In rats without access to water a single dose of 3 or 4 g. NaCl per kg. bodyweight was lethal. At very high salt concentrations the rats were unable to satisfy their needs for energy and for water, though a few rats drank water equivalent to their bodyweight.—D. Duncan.

3395

TOUSSAINT, C., WOLTER, R. and SIBILLE, P. Hypertension et lésions artérielles provoquées chez le rat par l'ingestion de quantités excessives de chlorure de sodium. [**Hypertension and arterial lesions in the rat after ingestion of large amounts of sodium chloride.**] *Rev. belg. Pathol. Méd. exp.*, 1953, **23**, 83-101. [Lab. Anat. Pathol., Univ. Brussels.] English summary.

Six groups of rats were selected according to weight and sex, and all received to appetite a diet with the percentage composition sugar 43, casein 30, arachis oil 15, salt mixture without NaCl 5, brewer's yeast 4, vitamin mixture 3. Controls received 1 per cent., experimental rats 2, 2.5 or 3 per cent., NaCl in the drinking water, and certain

of them received extra salt in the food when the drinking fluid failed to produce polydipsia.

With 2 or 2.5 per cent. NaCl, polydipsia occurred after about a week and reached as much as 100 ml. per 100 g. bodyweight in 24 hr. With the extra addition of 5 per cent. NaCl to the food, polydipsia and polyuria were even greater, but usually decreased within 24 hr. after withdrawal of the supplement. Rats receiving 2 per cent. saline did not show increased blood pressure, but with the higher intakes transient hypertension occurred in some animals, lasting 4 to 7 days. There was some relation between hypertension and plasma Na concentration; in some animals there was an increase in plasma N.P.N., but it did not appear to be related to plasma Na or to blood pressure.

In 16 of 27 rats examined there were arterial lesions of the heart and, in some of these, also of the pancreas and kidneys. The lesions are described and illustrated. The adrenal cortex showed atrophy in the glomerular zone in all the rats exposed to NaCl, and the hypothalamo-hypophyseal system showed enlarged cells and evidence of hypersecretion.—D. Duncan.

3396

GRØNBÆK, P., RUD, C. and SØRENSEN, N. S. **Cation-exchanging resins.** *Proc. XXIII Scand. Congr. Int. Med., Oslo*, 26-28 June 1952; *Acta med. scand.*, 1953, **147**, Suppl. 287, 69 (with discussion 70). [Hillerød.]

3397

SPENCER, A. G. and LLOYD-THOMAS, H. G. L. **A critical analysis of cation-exchange therapy.** *Brit. Med. J.*, 1954, **i**, 597-603. [Med. Unit, University Coll. Hosp. Med. Sch., London, W.C.1.]

Thirty patients with cardiac and 9 with renal oedema were treated in bed on a low-salt diet with restricted fluid. After a control period cation exchange resins were given. The dose was generally 20 g. thrice daily after meals and treatment lasted from 2 to 8 weeks.

Treatment resulted in rapid loss of weight with water diuresis, and results were classified on the degree of weight loss. They were excellent in 13, considerable improvement was obtained in 8, and there was no definite improvement in 11; 7 had insufficient oedema to allow of this method of assessment. Treatment was most effective in patients with type II nephritis or chronic rheumatic heart disease without cardiac cirrhosis. Results were poor in patients with chronic congestive heart failure, renal failure or plasma Na below 130 m. equiv. per litre. Three patients died during treatment. Minor gastro-intestinal discomfort occurred in 67 per cent.

Na balance studies were made on 12 patients; in 8 there was a mean negative Na balance of 48 m. equiv. daily and in the grossly oedematous the total Na loss was great. The faecal Na loss varied greatly and might decline during prolonged treatment; loss of water and salt through the urine during the resin treatment was important. No sign of salt depletion was seen. Weakness associated with low plasma K was seen in 7 patients. There was little change in plasma Na, and blood urea rose only in patients with pre-existing renal failure. Signs of K depletion developed in 19 patients, and in 26 of 83 samples analysed the plasma concentration was below 4 m. equiv. per litre; the depletion arose from increased faecal K excretion. There was no evidence of Ca depletion, but there was a small loss of Mg.

The effectiveness of the treatment varied with intestinal motility; loose stools increased the Na loss, constipation decreased it. The resins were most effective when body Na was increased, unless plasma Na was low. Faecal Na loss was less when K intake was raised.—L. Wills.

3398

SPENCER, A. G., ROSS, E. J. and LLOYD-THOMAS, H. G. L. **Cation exchange in the gastrointestinal tract.** *Brit. Med. J.*, 1954, i, 603-606. [Med. Unit, University Coll. Hosp. Med. Sch., London, W.C.1.]

All the subjects had been treated with low-salt diet and cation exchange resins (see preceding Abst.). Analysis of the resin recovered from different parts of the intestinal tract showed that in the small intestine the resin had taken up large amounts of Na, 1.4 m. equiv. per g., compared with 0.5 m. equiv. K per g., but in the colon the Na and K uptakes became 0.9 and 0.8, and in the rectum 0.4 and 1.1 m. equiv. per g., respectively.

In 3 patients on a low-salt diet but without exchange resins the colon was washed out and 2 hr. later 5 g. cation exchange resin in the Na phase was introduced. The resin always lost Na and gained appreciable amounts of K and less Ca and Mg. With labelled isotopes to measure the net rate of exchange results of the same order were obtained.

In 7 constipated patients the stools were examined before and for 48 hr. after administration of an aperient which kept the faeces fluid. The mean faecal excretion of Na during this period increased from 21 to 69 m. equiv. and that of K from 69 to 103 m. equiv. daily; the Na bound to the resin increased from 0.32 to 0.68 m. equiv. per g. and the Na : K ratio rose from 0.26 to 0.73.

The net exchange of bound Na for K and other ions results from changes in the concentration and relative proportions of these ions in the fluids of the large bowel.—L. Wills.

See also Absts. 3210, 3215, 3229, 3235, 3290, 3294, 3307, 3453.

HALOGENS

3399

LIGHT, A. E. **Fluoride intake with relation to milk and water consumption.** *Arch. Biochem. Biophys.*, 1953, 47, 477-479. [Wellcome Res. Labs., Tuckahoe, N.Y.]

The subjects were 6 of the 12 women at Newburgh who had taken part in another investigation (see Abst. 919, Vol. 22). They were questioned, 9 months after the placental tissue had been obtained, about their present fluid intake and what it had been during pregnancy. It was found that the F content of the tissue was parallel, not to the volume of fluoridated water consumed, but to the volume of milk drunk. Further investigation is considered necessary.—D. Harvey.

3400

GERSHON-COHEN, J. and McCLENDON, J. F. **Fluorine in tea and caries in rats.** *Nature*, 1954, 173, 304-305. [Dept. Radiol., Albert Einstein Med. Centre, Philadelphia, Pa.]

A caries-producing diet of cracked yellow maize 800, alfalfa meal 30, linseed meal 60, sucrose 250, maize oil 80, active dried yeast 50 and salt 10 g. was used, to which 1 g. fresh liver was added once weekly. The diet was given to 30 rats with strong infusions of tea which contained 20 p.p.m. F., and as a control group 30 littermates had water with 0.02 p.p.m. F. The experiment began when the rats were 23 days old and continued for 16 weeks, by which time only 11 pairs survived. No difference between the groups appeared in the extent of their failure to gain weight, of decalcification of their skeletons or of caries production.

In the absence of the expected effect on skeletal calcification it is thought that more attention should be paid to dietary Ca and P, especially in view of the differences in amounts of F which have been reported as necessary to prevent caries in rats (McClure and Mitchell, *J. Biol. Chem.*, 1931, 90, 297, and Gershon-Cohen and McCleendon, *Amer. J. Roentgenol.*, in press).—D. Harvey.

3401

RADIKE, A. E. and MUHLER, J. C. **The incidence of dental caries in hamsters receiving two different water-soluble fluorides at low concentrations.** *J. Dent. Res.*, 1953, 32, 807-810. [Dept. Chem., Indiana Univ., Bloomington.]

Groups of 30-day-old hamsters were fed for 90 days on a caries-producing diet, with drinking water containing 10 µg. fluoride per ml. as stannous fluoride or sodium fluoride, or distilled water; they were then killed, severity of caries was judged by microscopic examination of the molars and F, Ca and P were estimated in the femurs.

Stannous fluoride was much more effective than sodium fluoride in reducing both incidence and

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severity of caries. Neither supplement impaired bone calcification. Less F was stored in the bones with stannous fluoride than with sodium fluoride. These results agree with those for the rat (Absts. 5468, Vol. 20; 3936, Vol. 21; Muhler *et al.*, *J. Amer. Dent. Assoc.*, 1953, **46**, 290).—W. M. Deans.

3402

MUHLER, J. C., NEBERGALL, W. H. and DAY, H. G. **Studies on stannous fluoride and other fluorides in relation to the solubility of enamel in acid and the prevention of experimental dental caries.** *J. Dent. Res.*, 1954, **33**, 33–49. [Dept. Chem., Univ. Indiana, Bloomington.]

In continuance of earlier work (Absts. 5468, Vol. 20 and 3936, Vol. 21) rats were given a caries-producing diet containing 3.3 p.p.m. F and a number of compounds were added to their drinking water to supply about 10 p.p.m. F. Teeth were examined for caries and for solubility of enamel in acid solutions. Mean values are tabulated for gains in bodyweight, number of carious lesions, their extent and distribution in different molars and the reduction in decay produced by each compound in comparison with distilled water.

In the first experiment only SnF_2 reduced caries significantly. A smaller reduction, greater in females than in males, occurred with HF and there was none with ammonium fluoroborate or NaF. In the second experiment NaF, SnF_2 and sodium hexafluorostannate were used, but only the two Sn compounds reduced the incidence. Increasing the pH of SnF_2 solution decreased its effectiveness in reducing caries. Stannous fluoroborate caused a good degree of reduction, PbF_2 did so to a less extent and Cu and Na fluoroborates were much less effective.

The F content of the right femur served as a measure of the amount of F stored by the skeleton. According to this criterion the amount retained from a particular compound was not useful as a measure of the degree of reduction of caries which the compound would produce. With two samples of SnF_2 which reduced caries to the same extent the amounts of F retained by the skeleton were not equal.

The effect of fluorides on the solubility of enamel in organic acids seemed to run parallel to their effect in reducing the incidence of caries.

D. Harvey.

3403

KONO, K. **Influence of chronic fluorosis on the bone growth, particularly on the epiphyseal cartilage.** *Shikoku Acta Med.*, 1953, **4**, No. 4, 1–12. [Dept. Int. Med., Sch. Med., Univ. Tokushima.] In Japanese: English summary.

Rabbits aged between 30 and 60 days were given between 30 and 140 mg. NaF per kg. body-

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weight for from 30 to 200 days. The effects on growth were measured by bodyweight and by weight, length and thickness of the humerus.

Poisoning by F disturbed both body and bone growth and osteoporosis was detected histologically. Figures are presented for zone widths for all epiphyseal cartilages in 3 experimental animals of different ages which had received different amounts of F and in 3 controls, and for the proximal cartilage of the tibia of all experimental animals. There are 17 illustrative plates. (From summary.)

D. Harvey.

3404

LOCKER, A. and SIEDEK, H. Die Wirkung von elementarem und ionisiertem Jod auf die Gewebsatmung. [The effect of elemental and ionised iodine on tissue metabolism.] *Ztschr. ges. exp. Med.*, 1953, **122**, 431–445. [1. Med. Klin., Univ. Vienna.]

3405

NOBLE, M. J. D. and ROWLANDS, S. **The utilization of radio-iodine during pregnancy.** *J. Obstet. Gynaecol. Brit. Empire*, 1953, **60**, 892–894. [Dept. Obstet. Gynaecol., Univ. Edinburgh.]

In 22 normal women after the 30th week of pregnancy the mean urinary excretion in 24 hr. of a single dose of radio-active iodine was 32.9 ± 10.25 per cent., compared with 47 ± 14.2 per cent. in non-pregnant women. Estimation in the puerperium was complicated by excretion of the radio-active iodine in the milk.—D. Duncan.

3406

NURNBERGER, C. E. and LIPSCOMB, A. **Transmission of radioiodine (I^{131}) to infants through human maternal milk.** *J. Amer. Med. Assoc.*, 1952, **150**, 1389–1400. [Div. Med., Univ. Tennessee Coll. Med., Memphis.]

Diagnostic tracer doses of 100 μC . carrier-free radio-active iodine were given to 2 negro women nursing 4-month-old infants. After 24 hr. their milk was found to contain 0.002 and 0.0013 μC . I^{131} per ml. and the infants' thyroids had taken up 5 and 6 per cent. of the dose. From this and follow-up studies it was concluded that in lactating women I^{131} should be used for diagnosis with caution and for treatment not at all.—W. M. Deans.

3407

MORIMOTO, H. and TAKAHASHI, S. [On the accumulation and distribution of iodine in the body of laying hens.] *Bull. Nat. Inst. Agric. Sci., Chiba, Japan* [G], 1953, No. 7, 175–180. In Japanese: English summary.

Small groups of laying hens were fed on a basal ration containing 0.4 mg. I per 100 g. or the same

ration with 50 mg. I as seaweed or 25 mg. I as thyroprotein. In 12 days the mean amount of I retained in the body was 81 per cent. of intake in the controls, 51 per cent. in those receiving seaweed and 65 per cent. in those receiving thyroprotein. The I concentration was highest in the thyroid, next in muscle and low in kidney, ovaries, liver and small intestine, but the total I accumulation was greatest in muscle, owing to the greater weight of the tissue. (From summary.)

W. Godden.

See also Absts. 3230, 3237, 3239, 3240, 3455.

IRON AND COPPER

3408

BADENOCH, J. and CALLENDER, S. T. **Iron metabolism in steatorrhoea. The use of radio-active iron in studies of absorption and utilization.** *Blood, J. Hematol.*, 1954, **9**, 123-133. [Nuffield Dept. Clin. Med., Radcliffe Infirmary, Oxford.]

In 16 subjects with steatorrhoea absorption of radio-active Fe given by mouth was poor compared with absorption in 15 controls without steatorrhoea. Subsidiary tests with some of the subjects indicated that Fe was better absorbed by the fasting than the fed subject and absorption was not improved by addition of ascorbic acid to the test dose.

In a small group of subjects with steatorrhoea radio-active Fe given intravenously was rapidly and completely utilised.

It is suggested that poor absorption of Fe may not be the sole cause of anaemia in steatorrhoea. There may be excessive loss of Fe.—F. C. Aitken.

3409

BERGSTRÖM, I. and MAGNUSSON, G. **Autoradiografiska studier över ^{59}Fe -upptagningen. [Autoradiographic studies of absorption of ^{59}Fe .]** *Nord. Med.*, 1953, **50**, 1736-1738. [Med. Klin., Serafimerlasaret, Stockholm.] English summary.

3410

STEWART, W. B., VASSAR, P. S. and STONE, R. S. **Iron absorption in dogs during anemia due to acetylphenylhydrazine.** *J. Clin. Invest.*, 1953, **32**, 1225-1228. [Dept. Pathol., Coll. Phys. Surg., Columbia Univ., New York.]

3411

HEILMEYER, L. **Neuere Ergebnisse der Eisenstoffwechsel-forschung bei der Hämochromatose. [Recent data on iron metabolism in haemochromatosis.]** *Deutsch. med. Wochenschr.*, 1954, **79**, 280-284. [Med. Klin., Univ. Freiburg i. Br.]

3412

MESSERLI, H. **Untersuchungen über Eiweissmangel als Ursache der Hämochromatose. [Protein deficiency as a cause of haemochromatosis.]** *Internat. Ztschr. Vitaminforsch.*, 1954, **25**, 225-240. [Pathol. Inst., Univ. Berne.] English and French summaries.

When young rats were given protein-deficient diets providing 5 per cent. protein for 5 weeks and 3 per cent. for 13 weeks, with 2 per cent. Fe citrate, there was deposition of Fe in the tissues in the form of haemosiderosis, but without morphological signs of haemochromatosis. The localisation of Fe in the cells was much the same as in ordinary haemosiderosis. The experiments gave no support for the idea that haemochromatosis is caused by protein deficiency.—M. B. Richards.

3413

HAMPTON, J. K. (Jr.) **Uptake of radioiron in tissue storage compounds in normal and hemolytic mice and its utilization for erythropoiesis.** *Amer. J. Physiol.*, 1954, **176**, 20-24. [Dept. Physiol., Sch. Med., Tulane Univ., New Orleans, La.]

Nine normal mice each received an intravenous injection of 75 μg . ^{59}Fe as citrate 4 days before being killed. The distribution of ^{59}Fe in the tissues was studied. Liver homogenates were divided as described by Hampton and Kahn (Abst. 847, Vol. 24) into haemosiderin-rich (HRF) and ferritin-rich (FRF) fractions. The proportion of ^{59}Fe in the FRF was about 17 per cent., and little greater than that in the HRF.

Haemosiderosis was produced in 9 mice by intravenous injection of 4 mg. saccharated Fe oxide 7 days before the ^{59}Fe injection. The haemosiderosis did not affect ^{59}Fe uptake by the kidney, spleen or HRF, but the specific activity of the blood was only half that found in the controls. The total FRF was 7 times that in controls, and its ^{59}Fe content was 14.7 μg . compared with 8.8 μg . in controls. The entire injected dose was only one-fifth the size of the total FRF, so the capacity of the latter was not severely tested.

In 6 mice which had been bled 7 days after the ^{59}Fe injection and killed 11 days later the specific activity of the blood showed twice as much ^{59}Fe utilisation as in controls. The total Fe in the FRF was about half that in controls, but the HRF was unchanged. Both fractions showed considerable reduction of ^{59}Fe , indicating that both ferritin and haemosiderin Fe were available for metabolism. It is suggested that the Fe last received was first used for blood formation and that mixing of ^{59}Fe with previously stored Fe was incomplete.—D. Duncan.

See also Abst. 3177.

OTHER MINERALS

3414

CALHOUN, J. A., McLEAN, R., HUDSON, J. C. and AUB, J. C. **Comparative exchange of calcium, lead, and radioactive lead in dogs.** *Arch. Indust. Hyg.*, 1954, **9**, 9-22. [Med. Labs., Collis P. Huntington Mem. Hosp., Massachusetts Gen. Hosp., Boston.]

Lead is considered to behave in the bones like Ca.

Two dogs received inert Pb in 6 injections during 12 to 18 days, without ill effect. Ten others received Pb mixed with radium D, ^{210}Pb , in amounts from 0.2 to 2.3×10^{-1} mC. per kg. body-weight. Metabolic studies were continued for 3 or 4 months on the 2 former and 4 of the latter, and the effects of high and low Ca intakes and parathyroid extract were compared.

More Pb and ^{210}Pb was excreted in urine than in faeces. Roughly 67 per cent. of the ^{210}Pb excreted was in urine. ^{210}Pb was toxic, the toxicity being proportional to the amount of radio-activity; 5 of the dogs were found dead from 6 to 136 days after the injections and the other 5 were killed when their condition deteriorated, 142 to 246 days after the injections. In those which survived for several months 60 to 80 per cent. of the injected ^{210}Pb was excreted. Parathyroid extract and Ca intake did not affect ^{210}Pb excretion.

After some months those dogs on metabolism trials which had received ^{210}Pb showed increasing abnormalities of urine composition, excretion of albumin and sugar, epithelial casts and low sp. gr. One had terminal haematuria.

The pathology of the kidney differed from that in other radiation injury. Bone marrow injury was found in 2 dogs.—D. Duncan.

3415

McLEAN, R., CALHOUN, J. A. and AUB, J. C. **Migration of inorganic salts in bone as measured by radioactive lead and by alizarin.** *Arch. Indust. Hyg.*, 1954, **9**, 113-121. [Med. Labs., Collis P. Huntington Mem. Hosp., Massachusetts Gen. Hosp., Boston.]

Bone and tooth samples were obtained from the dogs described in the preceding paper. The amounts of ^{210}Pb in these tissues depended on the total amount of Pb given. Storage of ^{210}Pb was 5 to 16 times as great in the trabeculae as in the cortex, less in dentine than in cortex and not detectable in tooth enamel.

In cats fed on madder and killed immediately the dye was almost confined to the trabeculae, but when several months elapsed between madder feeding and death the trabeculae were pearly white and the cortex pink. This demonstrates the migration of Ca from the trabeculae to the cortex

and its relative stability in the cortex. The ^{210}Pb was less sensitive as an indicator, but also suggested transport from trabeculae to cortex.

D. Duncan.

3416

JAFFE, W. G. Cobalto en la reproduccion de ratones y ratas. Ensayos con dietas altas y proteinas. [Cobalt in reproduction of mice and rats. Trials with high-protein diets.] *Arch. venezol. Nutricion*, 1952, **3**, 335-341. [Inst. Nac. Nutrición.] English and German summaries.

The effect of Co supplementation of a diet high in protein and low in vitamin B₁₂ was investigated in reproduction tests on rats and mice which had been bred for several generations on a vegetarian diet low in vitamin B₁₂. Pregnant females were given a diet containing 40 per cent. protein, half of them receiving a 0.005 per cent. solution of CoCl₂ as drinking water.

In the groups given Co there was an increase in the average weaning weight of the young from 36.4 to 44.2 g. and from 30.8 to 33.5 g. in 2 series of rat experiments, and from 9.0 to 10.4 g. in mice, but the increases were not statistically significant. There was also an increase, again not significant, in the number of surviving young per litter born.

The beneficial effects of Co supplementation on the high-protein diet were less than in previous experiments with diets of normal protein content, and possible reasons for the difference are discussed.—M. B. Richards.

3417

KULWICH, R., HANSARD, S. L., COMAR, C. L. and DAVIS, G. K. **Copper, molybdenum and zinc interrelationships in rats and swine.** *Proc. Soc. Exp. Biol. Med.*, 1953, **84**, 487-491. [Atomic Energy Commission Agric. Res. Program, Univ. Tennessee, Oak Ridge.]

Weanling rats and 10-week-old pigs were given for 14 and 27 weeks, respectively, diets containing supplementary Mo, Cu or Zn. During the week before slaughter radio-active Cu was given by mouth.

In rats, liveweight increase was not affected by Cu, 200 p.p.m., or Zn, 1000 p.p.m., but was reduced by Mo, 1000 p.p.m. Very high concentrations of total and radio-active Cu were found in the tissues, particularly in the liver and kidneys, of rats which received Mo. This was not much altered by the addition of 200 p.p.m. Cu to the Mo diet.

In pigs accumulation of Cu in liver and kidney took place in animals which received Mo, but there was little retardation of growth and food utilisation was not impaired.—R. Hill.

3418

BINNERTS, W. T. Weinig of veel molybdeen in de voeding. [**Little or much molybdenum in the diet.**] *Voeding*, 1954, **15**, 111-116. [Lab. Physiol. Dieren, Landbouwsch., Wageningen.] English summary.
A review.

3419

BURKE, J. D., ARRINGTON, L. R. and DAVIS, G. K. **Blood volume and molybdenum toxicity in rabbits.** *Blood, J. Hematol.*, 1953, **8**, 1105-1106. [Dept. Biol., Univ. Florida, Gainesville.]
The blood volume of normal rabbits and those rendered anaemic by being given Mo, as measured by the Evans Blue and ^{32}P methods, was within the normal range.—W. Godden.

3420

FRIEDEL, W. Über Stickstoff- und Schwefelausscheidung im Urin bei Säuglingen mit akuten Ernährungsstörungen. [**Excretion of nitrogen and sulphur in the urine of infants with acute disturbances of nutrition.**] *Deutsch. Ztschr. Verdauungs- u. Stoffwechseler.*, 1953, **13**, 257-261. [Kinderklin., Univ. Leipzig.]

In infants without intestinal disturbance neutral S in the urine formed from 5.3 to 11.7 per cent. of the total S and the N : S ratio was between 12.6 and 16.3. These may be regarded as normal. In infants suffering from severe nutritional disturbances the percentage of neutral S in the urine ranged from 24.4 to 51.3, and the N : S ratio from 3.9 to 8.4. It is considered that the low N : S ratio may be a sign of regenerative metabolism after acute nutritional disturbance, the endeavour to make up N loss leading to increased retention of dietary N and so diminishing the N : S ratio in the urine.—M. B. Richards.

3423

BENEZECH, C. Quelques aspects de la physiologie générale de l'eau. [**Some aspects of the general physiology of water.**] *Bull. Soc. sci. Hyg. aliment.*, 1953, **41**, 199-208. [Fac. Méd., Montpellier.]

3424

MATHÉ, G. Physiologie de la soif. [**Physiology of thirst.**] *Bull. Soc. sci. Hyg. aliment.*, 1953, **41**, 209-213. [Hôp. Necker, Paris.]

3425

WARTER, J., MANDEL, P. and CUNY, S. Étude sur la répartition de l'eau chez le rat au cours du jeûne protidique prolongé. [**Distribution**

3421

WÜST, H. Verhalten der Harnsulfate und der Gesamtstickstoffausscheidung nach Einnahme elementaren Schwefels beim Menschen. [**Behaviour of urinary sulphates and total nitrogen excretion in man after ingestion of elemental sulphur.**] *Ztschr. ges. exp. Med.*, 1954, **123**, 171-176. [Inst. Physiol., Med. Akad., Düsseldorf.]

The excretion of sulphates in the urine of healthy human subjects was studied after intake of preparations of the element S. The magnitude of the excretion depended on the size of the S particles ingested. It was greatest for "Sulfactol", a preparation of finely divided S, and amounted to 78 per cent. of the intake; a distinct increase in excretion was evident 2 to 4 hr. after ingestion, indicating rapid absorption of S from the intestine. With precipitated S, 36 per cent. was excreted as sulphate, the increase showing only after 4 to 6 hr. An unexpected result was the fall in urinary sulphates, after the initial increase, when medication was continued for several days. No significant change in urinary excretion of N was found during the experiment.—M. B. Richards.

3422

ELLIS, S., HUBLÉ, J. and SIMPSON, M. E. **Influence of hypophysectomy and growth hormone on cartilage sulfate metabolism.** *Proc. Soc. Exp. Biol. Med.*, 1953, **84**, 603-605. [Inst. Exp. Biol., Univ. California, Berkeley.]

After pituitary removal, young rats were given ^{35}S as sulphate; some also received growth hormone.

Pituitary removal caused an increase in specific activity of inorganic S in plasma and a decrease in that of rib cartilage. Growth hormone partly reversed these effects.—R. Hill.

See also Abst. 3231.

METABOLISM OF WATER

of water in the rat during prolonged protein fast. *C.R. Soc. Biol.*, 1953, **147**, 1471-1475.

Rats were depleted of protein in 4 or 6 weeks, losing between 20 and 47 per cent. of their initial bodyweight. At the end each received an intramuscular injection of sodium thiocyanate, 95 mg. per kg. bodyweight, and was killed 1 hr. later. The difference between thiocyanate space and total water content represented the intracellular water.

After 4 weeks of depletion the average loss of total protein was 13 per cent. and that of total water 29 per cent. Extracellular water increased, and after 6 weeks was 60 to 80 per cent. above the initial value. Plasma albumin decreased considerably.—D. Duncan.

See also Absts. 3019, 3215, 3250, 3296, 3377, 3378, 3394, 3397, 3480, 3481.

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METABOLISM OF OTHER SUBSTANCES

3426

PRESTON, E. (III), HUNT, A. D. (Jr.), SCOTT, T. F. M. and SPUR, B. **Short-term feeding studies in infants and children with certain surface-active agents used in food technology: absence of evidence of toxic effects.** *J. Clin. Nutr.*, 1953, **1**, 539-550. [Child. Hosp., Philadelphia, Pa.] Spanish summary.

Two children were given 4 g. sorbitan monostearate (Span 60) daily for 37 and 32 days; 3 infants were given 1 g. polyoxyethylene (20) sorbitan monostearate (Tween 60) daily for 31, 34 and 13 days; 2 children were given 4 g. polyoxyethylene (8) stearate (Myrj 45) daily for 16 and 14 days. These children were classed as normal for the purposes of the study. They showed no obvious harmful effect and a follow-up of 4 of them 4 to 6 months later showed normal progress. There was no gross laboratory evidence of toxicity in blood counts, urine analyses, pancreatic enzymes, gastrointestinal X-ray studies or analyses of stools for fat and nitrogen.

One infant suffering from "mucoviscidosis" was given Tween 60 for 12 days. This infant died. F. C. Aitken.

3427

GRÖNWALL, A. and WIKSTRÖM, K. **On the occurrence of dextran in the gastrointestinal tract after intravenous infusion of dextran solutions (Macrodex).** *Acta Soc. Med. upsalien.*, 1953, **59**, 24-32. [Central Lab., Univ. Hosp., Upsala.]

Intravenous infusions of dextran were given to dogs with gastric pouches, to two healthy human subjects, and to a patient with intestinal fistulae. A semi-quantitative serological method indicated the presence of dextran in the digestive tract, but in such low concentrations as to have little practical significance.—M. B. Richards.

3428

LUCAS, J. and ORTEN, J. M. **Dietary protein and glycine as precursors of porphyrins in the rat.** *J. Nutrition*, 1954, **52**, 89-97. [Dept. Physiol. Chem., Coll. Med., Wayne Univ., Detroit, Mich.]

Groups of 6 or 12 rats weighing from 180 to 200 g. received a basal diet of percentage composition casein 20, maize oil 23, cod liver oil 2, sucrose with vitamins 10, dextrin 41 and salt mixture 4. One group received the basal diet only, one the basal diet for 4 weeks and a low-protein diet for 4, one the basal diet with 2 per cent. glycine for 4 weeks and without for 4, the fourth basal diet with sodium benzoate 3 per cent. for 4 weeks and 10 per cent. for 4, and the fifth the basal diet supplemented

with 3 per cent. sodium benzoate and 2 per cent. glycine for 4 weeks and then with 10 per cent. sodium benzoate and 5 per cent. glycine. Total and individual porphyrins were estimated in pooled samples of faeces.

Glycine slightly increased porphyrin formation and sodium benzoate or protein restriction diminished it. Glycine reduced the inhibitory effect of sodium benzoate. Protoporphyrin made up about half the total faecal porphyrin; coproporphyrin and uroporphyrin occurred only in traces, so the "total porphyrin" procedure measured also some unidentified non-porphyrin pigments. Rats on basal diet constantly excreted about 35 µg. protoporphyrin per g. protein ingested and this was decreased by benzoate; but on low-protein diet the amount rose to 153 µg. per g. protein. A high priority for porphyrin formation appears to exist when either protein or glycine is restricted.—D. Duncan.

3429

SINITSYNA, A. L. **Obmen glyutationa i ego biologicheskie funktsii. [Glutathione metabolism and its biological function.]** *Uspekhi Sovrem. Biol.*, 1953, **35**, 313-337. [Moscow.]

3430

MITCHELL, R. G. and CODE, C. F. **Effect of diet on urinary excretion of histamine.** *J. Appl. Physiol.*, 1954, **6**, 387-392. [Sect. Physiol., Mayo Found., Rochester, Minn.]

After 3 days on mixed diet, 5 healthy adults fasted for 3 days, then had bread and milk diet for 2 days, followed by a meat diet for 3 days. In each subject the mean daily excretion of both free and conjugated histamine was less during fasting than on mixed diet. Bread and milk did not significantly increase excretion above the fasting levels, but the meat diet did. In general the output of conjugated histamine showed more pronounced changes than that of free histamine.

When histamine was given to fasting subjects by mouth, no change occurred in the urinary output of free histamine, but large amounts of conjugated histamine appeared from the third hour onwards. No change in the output of free histamine occurred after a meal of bread, milk and butter, but a sharp increase occurred if the meal and histamine were given together.

M. B. Richards.

3431

SCHLÜSSEL, H. **Beitrag zur Verwertung mehrwertiger Alkohole in der Ernährung. [Utilization of polyhydric alcohols in the diet.]** *Arch.*

exp. Pathol. Pharmacol., 1954, **221**, 67-75.
[Med. Klin., Univ. Cologne.]

In preliminary experiments female albino rats weighing about 70 g. were fed individually on a basic diet of oat flakes 60, glucose 20.3, gelatine 10, butterfat 5 and minerals 3.7 per cent. or the same with 5, 10, 20, 30 or 40 per cent. of the energy supplied by one of 7 polyhydric alcohols at the expense of glucose or glucose and oat flakes. 1:6-Hexanediol, 2:5-hexanediol, 1:4-butanediol and 1:2:4-butanetriol were found to be toxic.

Further trials with 8 rats on each diet were made with 1:3-butanediol, which is an intermediate in the manufacture of Buna rubber,

mesoerythritol and 1:2-butanediol, and with a diet in which 1:3-butanediol supplied 10, mesoerythritol 5, 1:2-butanediol 5 and *Torula utilis* 20 per cent. of the energy.

The least toxic was 1:3-butanediol, no toxic sign being found below the 30 per cent. level; mesoerythritol was tolerated at the 10 per cent. level and 1:2-butanediol at the 5 per cent. All these in non-toxic amounts, and also the mixture with yeast, improved total energy intake, weight gain and feeding efficiency compared with the basic diet. The suggestion is made that small quantities of polyhydric alcohols, preferably 1:3-butanediol, might be tested on fattening livestock.

W. M. Deans.

METABOLISM OF CELLS, TISSUES, ETC.

GENERAL PHYSIOLOGY

3432

WERTHEIMER, E., BENTOR, V. and WURZEL, M.
In vitro demonstration of metabolic changes during heat regulation in rats. *Biochem. J.*, 1954, **56**, 297-302. [Lab. Pathol. Physiol., Hebrew Univ., Jerusalem.]

3433

WILSON, T. H. and WISEMAN, G. Metabolic activity of the small intestine of the rat and golden hamster (*Mesocricetus auratus*). *J. Physiol.*, 1954, **123**, 126-130. [Med. Res. Unit Res. Cell Metabol., Dept. Biochem., Univ. Sheffield.]

3434

PENNINGTON, R. J. The metabolism of short-chain fatty acids in the sheep. 2. Further studies with rumen epithelium. *Biochem. J.*, 1954, **56**, 410-416. [Rowett Res. Inst., Bucksburn, Aberdeenshire.]

Rumen epithelial tissue was incubated as described in Abst. 2562, Vol. 22. The rate of metabolism of acetic, butyric and propionic acids was studied under different concentrations of CO₂ in the gas phase and in the presence of malonate, fumarate and ammonium ions.

The rate of metabolism of propionic acid increased with increasing concentrations of CO₂ up to 20 per cent. of the gas phase, the other 80 per cent. being O₂; no such effect was noted on the rate of disappearance of acetate and butyrate. In the presence of malonate utilisation of each fatty acid was inhibited; ketone body production from butyrate was depressed, but little effect was observed on the proportions of ketone bodies formed. Succinate was produced when propionate was metabolised in the presence of malonate. Butyrate metabolism was not affected by the

presence of ammonium ions, though propionate, and possibly acetate, metabolism was inhibited. In the absence of CO₂ propionate depressed the oxygen uptake of the tissue: respiration was, however, stimulated by propionate in the presence of CO₂.

G. A. Garton.

3435

CHASE, H. B. Growth of the hair. *Physiol. Rev.*, 1954, **34**, 113-126. [Dept. Biol., Brown Univ., Providence, R.I.]

3436

CASTEN, G. G. and MARSH, J. B. Metabolic studies on cardiac tissue obtained by needle biopsy in the intact unanesthetized dog. *Circulation Res.*, 1953, **1**, 226-229. [Dept. Cardiorespiratory Dis., Army Med. Serv. Grad. Sch., Walter Reed Army Med. Centre, Washington, D.C.]

Dogs were subjected to a preliminary operation in which the apex of the heart was anchored to the chest wall. After 10 days biopsy specimens could be obtained from the myocardium. A series of samples could be taken from the same animal, one-third of the 65 dogs having had 8 or 10 biopsies each involving from 3 to 5 cardiac punctures; a limit was imposed by the development of fibrosis.

Glycogen content of the biopsy specimens was not affected by anaesthesia. Administration of the digitalis preparation lanatoside-C significantly increased the glycogen content. Formation of glycogen from glucose *in vitro* could not be demonstrated. The average oxygen uptake was 30 μ M per g. wet tissue per hr., resembling that of surviving heart slices *in vitro*. The mean N content was 32.6 mg. per g. wet weight.

D. Duncan.

3437

PITTONI, A. and GOTTE, L. Alcuni confronti fra il metabolismo del miocardio e del suo tessuto

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di conduzione. I. Il quoziente respiratorio, la glicolisi anaerobia e il contenuto in cocarbossilasi. [Some comparisons between the metabolism of the myocardium and of its conducting tissues. 1. The respiratory quotient, anaerobic glycolysis and cocarboxylase content.] *Arch. Sci. biol., Bologna*, 1953, **37**, 525-532. [Ist. Biochim., Univ. Padua.]

3438

MILLER, L. L. and BALE, W. F. **Synthesis of all plasma fractions except gamma globulins by the liver. The use of zone electrophoresis and lysine- ϵ - C^{14} to define the plasma proteins synthesized by the isolated perfused liver.**

MILLER, L. L., BLY, C. G. and BALE, W. F. **Plasma and tissue proteins produced by non-hepatic rat organs as studied with lysine- ϵ - C^{14} . Gamma globulins the chief plasma protein fraction produced by non-hepatic tissues.** *J. Exp. Med.*, 1954, **99**, 125-132; 133-153. [Dept. Radiation Biol., Sch. Med. Dent., Univ. Rochester, N.Y.]

Plasma specimens were obtained from rat livers perfused with plasma containing lysine- ϵ - ^{14}C under conditions reported earlier (*J. Exp. Med.*, 1951, **94**, 131) and also from rats which had received intraperitoneal injections of DL-lysine- ϵ - ^{14}C 6 hr. before blood was drawn. Plasma proteins were fractionated by the method of Kunkel and Slater (*Proc. Soc. Exp. Biol. Med.*, 1952, **80**, 42). The isolated perfused liver incorporated ^{14}C into the plasma albumin and α - and β -globulins, but not into γ -globulin. The γ -globulin from the plasma of intact rats contained ^{14}C . There was evidence that the α -globulins turn over more rapidly than other major plasma fractions. In all samples they had more specific activity than any other fraction.

The non-hepatic tissues in a "carcase" (caudal half of the rat) perfused with plasma as above for 6 hr. showed good clearance of lysine- ϵ - ^{14}C and glucose from the perfusate and formation of tissue and plasma proteins. ^{14}C -labelled plasma proteins obtained from an eviscerated surviving rat 6 hr. after intravenous injection of lysine- ϵ - ^{14}C showed most of its ^{14}C activity in the γ -globulins, with slight activity in the α - and β -globulins but none in the albumin fraction.—W. Godden.

3439

KRUHÖFFER, P. and MUNTZ, J. A. **Carbohydrate metabolism of the isolated, perfused cat liver as studied by labelled glucose and fructose.** *Acta physiol. scand.*, 1954, **30**, 258-274. [Inst. Med. Physiol., Univ. Copenhagen.]

Isolated cat livers perfused with blood readily utilised DL-alanine or fructose. Glucose was released to the blood; blood sugar increased when alanine was given, and glycogen formation was

slight or absent. With fructose glycogen was deposited and blood sugar rose. When radio-active glucose was added to the blood between 7 and 10 per cent. was deposited in glycogen, and this was increased by addition of inactive fructose. When radio-active and inactive fructose were given much more of the radio-activity appeared in glycogen and in CO_2 .

Thus although there was no net uptake of glucose, glucose was metabolised. Much of it was incorporated into glycogen as an intact unit, thought to be evidence of direct phosphorylation. The actual rate of phosphorylation may have been as high as 2.6 mg. per min. per 100 g. tissue. The rate of fructose phosphorylation was at least 30 mg. per min. per 100 g.—D. Duncan.

3440

FRUNDER, H. and FRIEDEL, W. **Über die Sauerstoffaufnahme von Schnitten experimentell verfetteter Lebern. [The oxygen uptake of slices of experimental fatty livers.]** *Hoppe-Seyler's Ztschr.*, 1953, **295**, 77-83. [Physiol. Chem. Inst., Univ. Leipzig.]

3441

HAUGAARD, E. S. and HAUGAARD, N. **The effect of hyperglycemic-glycogenolytic factor on fat metabolism of liver.** *J. Biol. Chem.*, 1954, **206**, 641-645. [John Herr Musser Dept. Res. Med., Univ. Pennsylvania, Philadelphia.]

Rats were fed on a stock diet to which bread was added on the day before they were killed. Liver slices were prepared and incubated for 3 hr. at 38° C. in Krebs Ringer bicarbonate buffer containing ^{14}C -labelled glucose or fructose, with or without the addition of hyperglycaemic-glycogenolytic factor (HGF: see Sutherland and de Duve, *J. Biol. Chem.*, 1948, **175**, 663-674). At the end of the incubation fatty acids were isolated and their ^{14}C -content was estimated. Fatty acid formation from both glucose and fructose was reduced by about 30 per cent. in the presence of HGF.

In further experiments liver slices prepared in the same way were incubated for 90 min. at 38° C. in Krebs Ringer bicarbonate buffer with or without Na acetate and in the presence or absence of HGF. Total ketone production was measured at the end of the incubation period. Ketone body production was increased in the presence of HGF whether or not acetate was present.—G. A. Garton.

3442

FRANTZ, I. D. (Jr.) and BUCHER, N. L. R. (with SCHNEIDER, H. S., MCGOVERN, N. H. and KINGSTON, R.) **The incorporation of the carboxyl carbon from acetate into cholesterol by rat liver homogenates.** *J. Biol. Chem.*,

1954, **206**, 471-481. [Cardiovascular Res. Lab., Dept. Med., Harvard Med. Sch., Boston, Mass.]

Cell-free homogenates from the livers of female rats were incubated for 2 hr. at 37° C. with acetate labelled with ^{14}C in the carboxyl group. Cholesterol was then isolated as the digitonide and rigorously purified through the dibromide and acetylation. The radio-activity was measured at all stages of the purification.

It was concluded that the radio-active material precipitated by digitonin was mainly cholesterol digitonide.—G. A. Garton.

3443

HOTTA, S., HILL, R. and CHAIKOFF, I. L. **Mechanism of increased hepatic cholesterogenesis in diabetes: its relation to carbohydrate utilization.** *J. Biol. Chem.*, 1954, **206**, 835-844. [Dept. Physiol., Sch. Med., Univ. California, Berkeley.]

Normal and alloxan-diabetic rats were fed on high-glucose or high-fructose diets before being killed. Liver slices were incubated with ^{14}C -labelled acetate as described by Chernick *et al.* (Title 2382, Vol. 20). Cholesterol was isolated as digitonide from the incubation mixture and assayed for ^{14}C activity.

The capacity of liver slices of diabetic rats fed on glucose to incorporate ^{14}C -acetate into cholesterol was more than double that of slices from normal rats fed on either the high-glucose or the high-fructose diet. Fructose, on the other hand, appeared to be used for cholesterol synthesis at the normal rate in the diabetic liver slices. Liver slices from diabetic rats fed on the high-fructose diet showed a normal rate of incorporation of labelled acetate into cholesterol.—G. A. Garton.

3444

POPJÁK, G. **Biosynthesis of squalene and cholesterol in vitro from acetate- 1-C^{14} .** *Arch. Biochem. Biophys.*, 1954, **48**, 102-106. [Nat. Inst. Med. Res., Mill Hill, London.]

Liver slices from young rats and ovarian membranes (*granulosa* and *theca interna*) from laying hens incubated with acetate- $1\text{-}^{14}\text{C}$ synthesised both squalene and cholesterol.

According to the evidence presented, squalene is neither the immediate precursor of cholesterol nor an intermediate in its biosynthesis, though it may provide isoprenoid units for sterol anabolism.

G. A. Garton.

3445

MIGICOVSKY, B. B. and GREENBERG, D. M. **Effect of coenzyme A on cholesterol formation by rat liver homogenates.** *Biochim. biophys. Acta*, 1954, **13**, 135-136. [Div. Chem., Sci. Serv., Canada Dept. Agric., Ottawa.]

3446

KITTINGER, G. W. and REITHEL, F. J. **Lactose synthesis in mammary gland preparations.** *J. Biol. Chem.*, 1953, **205**, 527-533. [Dept. Chem., Univ. Oregon, Eugene.]

Homogenates were prepared of mammary tissue from lactating guineapigs 5 days *post partum*. For some of the tests a soluble protein preparation was made by extracting the minced glands with 0.2 M potassium citrate at pH 7.3. After centrifuging, the protein was precipitated with ethanol, suspended in 0.02 M potassium citrate and lyophilised. The preparations were usually completely soluble in water.

Lactose was synthesised from glucose- ^{14}C by homogenates only in the presence of added adenosinetriphosphate. Fermentation experiments with *Saccharomyces bayanus* and *S. carlsbergensis* suggested that the glucose and galactose moieties of the lactose so formed were equally labelled with ^{14}C . Lactose was synthesised by the homogenates from labelled starch in the absence of ATP. Lactose formation was not accelerated by addition of hexokinase or coenzyme I. Glycogen was formed from glucose or glucose-1-phosphate in homogenates of lactating, but not of regressive, glands.

The protein preparation catalysed the formation of lactose from labelled starch, but not from glucose-1-phosphate. Hexokinase activity was present, as both glucose and fructose disappeared when incubated with the preparation in the presence of ATP. Glucose-1-phosphate was converted to glycogen in the presence of added glycogen, but not in its absence. Neither starch nor glucose-1-phosphate was converted to pyruvic or lactic acid.

D. Duncan.

3447

BALMAIN, J. H., FOLLEY, S. J. and GLASCOCK, R. F. **Relative utilization of glucose and acetate carbon for lipogenesis by mammary-gland slices, studied with tritium, ^{13}C and ^{14}C .** *Biochem. J.*, 1954, **56**, 234-239. [Nat. Inst. Res. Dairying, Univ. Reading.]

Sliced mammary tissue from lactating rats and ewes was incubated in a medium containing ^{14}C -labelled glucose and carboxy- ^{13}C -Me- ^3H -labelled acetate. At the end of 3 hr., mixed fatty acids were isolated as Ca salts and the 3 isotopes present were estimated.

Rat gland incorporated about 8 times as much glucose carbon and about one-sixth as much acetate carbon into fatty acids as did slices from the sheep gland. Rat mammary gland tissue used acetate carbon or glucose carbon at about the same rate for fatty acid synthesis; sheep udder tissue, in a given time, used about 30 times as much carbon from acetate as from glucose. Compared with the utilisation of glucose alone, rat gland utilised less glucose for fatty acid synthesis when acetate was

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also present in the medium; acetate had no effect on the small utilisation of glucose by sheep gland. When added to the incubation medium, insulin promoted the utilisation of carbon atoms from glucose and acetate for fatty acid synthesis to about the same extent in rat gland; glycerol enhanced the conversion of acetate carbon to fatty acid to a greater extent than it promoted the utilisation of glucose carbon. Both carbon atoms of acetate were incorporated into fatty acid chains to about the same extent in both rat and sheep gland. During chain elongation about two-thirds of the hydrogen of acetate was lost or exchanged.

G. A. Garton.

3448

POPJÁK, G. and TIETZ, A. **Biosynthesis of fatty acids by slices and cell-free suspensions of mammary gland.** *Biochem. J.*, 1954, **56**, 46-54. [Nat. Inst. Med. Res., Mill Hill, London.]

Tissue slices and cell-free suspensions from the mammary glands of lactating rats and a lactating sheep were incubated for 3 hr. at 37.5°C. with [carboxy-¹⁴C] acetate in the presence of air or oxygen. Other substrates, glucose, adenosine-triphosphate (ATP), pyruvate, oxaloacetate, citrate, α -oxoglutarate, succinate, malate and glutamate were added to the incubation flasks as required. Oxygen consumption was measured and CO₂ was collected for estimation of radio-activity. At the end of incubation fatty acids were extracted from the slices or suspensions and fractionated chromatographically and their radio-activity was estimated.

In tissue slices glucose, pyruvate and other components of the citric acid cycle stimulated formation of fatty acid from acetate; the stimulation was especially effective in sheep udder tissue. Cell-free preparations from both rat and sheep tissue formed fatty acids from acetate. With rat mammary gland suspensions, the best results were obtained in the presence of oxaloacetate and ATP and under air. Fatty acid was formed by suspensions of sheep's udder in the presence of acetate alone; oxaloacetate had a stimulating effect, but ATP inhibited synthesis. Rat mammary gland suspensions did not oxidise acetate but similar preparations from sheep's udder did. All the saturated *n*-fatty acids containing an even number of C atoms from hexanoic to stearic and also oleic acid were identified in the rat mammary gland suspensions.—G. A. Garton.

3449

POPJÁK, G. and TIETZ, A. **Synthesis of fatty acids from acetate by preparation of the "cell-sap" of rat mammary gland.** *Biochem. J.*, 1954, **56**, xxiii. [Nat. Inst. Med. Res., Mill Hill, London, N.W.7.]

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3450

PEETERS, G., COUSSENS, R. and SIERENS, G. **The metabolism of propionic, butyric and β -hydroxybutyric acids in the perfused isolated cow's mammary gland.** *Arch. internat. Pharmacodyn.*, 1953, **95**, 153-171. [Dept. Pharmacol., Vet. Sch., Univ. Ghent.] French summary.

Udders were removed from normal lactating cows and bisected along the median septum. Each half was perfused for from 90 to 120 min. with 9 litres of heparinised and oxygenated blood at 38°C. By a constant drip device, 150 ml. solution containing one of the following was added to the oxygenated blood: Na propionate 15 g.; Na propionate 10 g. plus glucose 10 g.; glucose 15 g.; Na acetate 12 or 15 g.; Na acetate 15 g. plus Na propionate 10 g.; Na butyrate 12 g.; Na butyrate 8 g. plus glucose 10 g.; Na acetate 10 g. plus Na butyrate 8 g. plus glucose 10 g.; Na β -hydroxybutyrate 10 g. plus glucose 10 g.; Na β -hydroxybutyrate 10 g. plus Na acetate 12 g.; Na β -hydroxybutyrate 10 g. In several experiments no addition was made to one half of the udder, which served as control. Blood samples were taken periodically for estimation of glucose, acetoacetic acid, acetone, isopropanol, total ketone bodies and pyruvic acid. R.Q. values were calculated from the oxygen and CO₂ content of the arterial and venous blood supplies. Insulin was sometimes added to the perfusion fluid.

Oxygen uptake was considerably increased when Na propionate, butyrate or β -hydroxybutyrate was added to the arterial blood; and R.Q. was: Na propionate 0.73, Na butyrate 0.71, Na β -hydroxybutyrate plus glucose 0.79. In the presence of Na butyrate the isolated gland did not respond to insulin. In the presence of butyrate traces of acetoacetic acid were formed. No ketone bodies were formed from acetate. Considerable amounts of acetone, acetoacetic acid and isopropanol were produced from β -hydroxybutyrate. In the presence of butyrate or β -hydroxybutyrate, the addition of acetate stimulated respiration and produced a higher R.Q. Acetic acid was metabolised more rapidly than propionate, butyrate or β -hydroxybutyrate.

G. A. Garton.

3451

SCHMIDT, H. and STAUDINGER, HJ. **Stoffwechsel der Nebennierenrinde und Biosynthese der Corticosteroide. 4. Der Einfluss von C₄-Dicarbonsäuren auf die Biosynthese der Corticosteroide. [Metabolism of the adrenal and biosynthesis of corticosteroids. 4. Effect of C₄-dicarboxylic acids on biosynthesis of corticosteroids.]** *Biochem. Ztschr.*, 1954, **325**, 148-155. [Zentrallab., Städt. Krankenanst., Mannheim.]

Incubation experiments on homogenates prepared

from the adrenal glands of pigs showed that succinic, fumaric, malic and oxaloacetic acids increased formation of corticosteroids. At the optimum pH, between 7.2 and 7.4, oxaloacetate increased the yield of corticosteroids, as estimated chromatographically, by 80 to 100 per cent., succinate and fumarate by 70 to 80 and malate by 40 to 60 per cent. Na citrate at pH 7.4 had no activating effect. It is presumed that the C₄-dicarboxylic acids act as hydrogen carriers to the system.—M. B. Richards.

3452

DINNING, J. S., NEATROUR, R. and DAY, P. L. **Effect of diet on rat liver betaine transmethylase.** *Proc. Soc. Exp. Biol. Med.*, 1953, **84**, 499-501. [Dept. Biochem., Univ. Arkansas Sch. Med., Little Rock.]

Betaine transmethylase activity of liver was estimated by the method described in Abst. 1806, Vol. 21. The livers of rats on a basal diet showed no appreciable activity. When the diet was supplemented with amino-acids or proteins only the combination containing cystine, threonine, phenylalanine and tryptophan was effective, and of these amino-acids, given singly, only tryptophan caused appreciable activity.

There was no correlation between the growth of rats and the activity of their livers, which suggests that the amino-acid patterns required for these functions differ considerably.—D. Harvey.

3453

WHITTAM, R. and DAVIES, R. E. **Relations between metabolism and the rate of turnover of sodium and potassium in guinea pig kidney-cortex slices.** *Biochem. J.*, 1954, **56**, 445-453. [Dept. Biochem., Med. Res. Council Unit Res. Cell Metabol., Univ. Sheffield.]

3454

MINDER, W. and GORDONOFF, T. **Modellversuche über den Calciueinbau im Knochen. [Model experiments on calcium incorporation into bone.]** *Schweiz. med. Wochenschr.*, 1953, **83**, 825-828. [Radium Inst., Berne.]

Preparations from the same sample were made of fresh bone powder, bone powder heated at 800°C., and powdered apatite. Powders of different particle size were analysed. Radio-active ⁴⁵CaCl₂ in solution was added to them in suspension, and they were left to stand; samples were withdrawn from time to time and thoroughly washed and their content of ⁴⁵Ca was estimated. The greatest uptake was within the first hour, but ⁴⁵Ca content went on increasing slowly for more than 10 hr. The amount taken up by apatite was small. Heated bone took up 4 times as much as apatite, and fresh bone 2.85 times as much as heated bone.

The size of the particles and the concentration of ⁴⁵CaCl₂ did not affect the rate of uptake.

From the changes in the rate of uptake, it was concluded that the effect was probably not purely superficial, but that ⁴⁵Ca penetrated into the structure of the crystals. In support of the conclusions it was found that by washing with HCl about half the ⁴⁵Ca could be removed from the powders. From ion exchange experiments of the radio-active powders against water or non-radio-active CaCl₂ solutions of different strengths, the same conclusion was drawn; with the highest concentration of CaCl₂ only $\frac{3}{8}$ of the ⁴⁵Ca was withdrawn.—E. M. Hume.

3455

FISCHER, R. B., MUHLER, J. C. and WUST, C. J. **Effects of several fluoride reagents on the surface structure of powdered dental enamel.** *J. Dent. Res.*, 1954, **33**, 50-54. [Dept. Chem., Univ. Indiana, Bloomington.]

Powdered dental enamel was treated with a number of reagents and changes in enamel structure as demonstrated by electron and X-ray diffraction patterns were studied. KF caused transformation of apatite to calcium fluoride structure, the rate of change increasing as pH was reduced; sodium silicofluoride caused the same change but at a slower rate. Sodium monofluorophosphate did not affect the structure. With SnF₂ even after very brief treatment the apatite structure was changed to an amorphous one, but it was not possible to decide whether the surface itself had been changed or whether some amorphous substance had been deposited on it.

D. Harvey.

3456

ELLIS, G. H., BRANDT, C. S. and THACKER, E. J. **Factors influencing the uptake of iron by blood and by bone marrow cells in vitro.** *Science*, 1954, **119**, 94-95. [U.S. Plant, Soil, Nutrit. Lab., U.S. Dept. Agric., Ithaca, N.Y.]

The uptake of radio-active Fe by blood cells from rabbits and marrow cells from chickens or turkey poults was increased by washing the cells in saline, by raising the concentration of Fe in the solution, or by adding Cu. No correlation was found between reticulocyte count and Fe uptake. The Fe uptake by blood cells far exceeded the amount required for Hb formation.—D. Duncan.

See also Absts. 3010, 3038, 3218, 3220, 3333.

GROWTH AND METABOLISM OF TUMOUR CELLS

3457

CHALMERS, J. G. **Heat transformation products of cottonseed oil.** *Biochem. J.*, 1954, **56**, 487-492. [Cancer Res. Dept., Royal Beatson Mem. Hosp., Glasgow.]

N.A. and R., July 1954

Peacock *et al.* (*J. Nat. Cancer Inst.*, 1953, **13**, 931) reported the production of cancer by heated cottonseed-oil products. When these products were given by subcutaneous injection to mice no tumour occurred at the site of the injection in more than a year.—W. Godden.

3458

WILSON, J. W. **Nutritional deficiency produced in the mouse by feeding bentonite. Hepatomas in mice on a diet containing bentonite.** *J. Nat. Cancer Inst.*, 1953, **14**, 57–63; 65–75. [Arnold Biol. Lab., Brown Univ., Providence, R.I.]

When bentonite, a base-exchange silicate, was given to mice as 50 per cent. of a synthetic diet they developed fatty livers and other signs of choline deficiency. Replacement of the bentonite by pure cellulose (Ruffex) or by BaSO₄ did not produce the same effects. Choline or protein added to the 50 per cent. bentonite diet improved growth and prevented fatty degeneration. It is concluded that choline, amongst other things, was removed by the bentonite.

In other experiments 12 mice were maintained

on the 50 per cent. bentonite diet and, after more than 200 days, hepatomas were found in all but one. Earlier work (Title 2417, Vol. 21) had shown that such tumours occurred in mice on diets low in protein and deficient in choline, and it is suggested that conditions favouring their appearance were produced by bentonite.—D. Harvey.

3459

BURSELL, S., NAESLUND, G., NAESLUND, J. and SWENSON, K. E. **Investigations of malignant tumours with radioactive phosphocholine.** *Acta Soc. Med. upsalien.*, 1953, **59**, 1–11. [Clin. Obstet. Gynaecol., Univ. Upsala.]

Radio-active phosphocholine injected into mice was not selectively taken up by tumour cells, nor was it readily hydrolysed in the body.—I. Leitch.

3460

MULLER, G. **Über die Aufnahme von Aminosäuren durch Gewebeschnitte von Tumoren. [Uptake of amino-acids by tumour tissue slices.]** *Arch. Geschwulstforsch.*, 1953, **6**, 31–36. [Deutsch. Akad. Wissensch., Berlin.]

METABOLISM OF GROWTH, REPRODUCTION AND SENESCENCE

GROWTH

3461

MEDVEDEV, ZH. A. **Biokhimicheskie zakonomernosti rosta, stareniya, i obnoveniya kletochnykh form zhivoi materii. [Biochemical rules of growth, ageing, and restoration of cellular forms of live substance.]** *Uspekhi Sovrem. Biol.*, 1953, **35**, 338–356. [Moscow.]

3462

DE TONI, G. **Acerca de las relaciones existentes entre constitucion morfologica individual y crecimiento somatico. [The relation between individual morphologic constitution and somatic growth.]** *Rev. española Pediat.*, 1953, **9**, 967–975. [Clin. Pediat. "G. Gaslini", Univ. Genoa.] French, English and German summaries.

3463

VIVANCO, F. **Alimentacion y crecimiento. [Diet and growth.]** *Rev. clín. española*, 1953, **51**, 139–148. [Inst. Invest. Méd., Madrid.] A review.

3464

JACKSON, W. P. U. **The prediabetic syndrome. Large babies and the (pre)diabetic father.** *J. Clin. Endocrinol.*, 1954, **14**, 177–183. [Dept. Med., Univ. Cape Town.]

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3465

DOUGLAS, J. W. B. and MOGFORD, C. **The results of a national inquiry into the growth of premature children from birth to 4 years.** *Arch. Dis. Childhood*, 1953, **28**, 436–445. [Inst. Child Health, Univ. London.]

This is a follow-up of the premature children (those weighing 5½ lb. or less at birth), multiple and illegitimate births excluded, of the national survey of March 1946 ("Maternity in Great Britain", Royal College of Obstetricians and Gynaecologists and Population Investigation Committee, 1948). They were paired for sex, place in family, locality, social class and age of mother with full-term infants born during the survey week. Of the original 676 pairs, 464 were still available in 1950; height and weight measurements at ages 2 years and 4 years 3 months were secured for some 360 pairs only, but the evidence does not suggest that these were in any way selected. The results are given in tables and frequency diagrams. The health of the children has been previously reported on (*Brit. Med. J.*, 1953, i, 748); their development and behaviour will be described in a future paper.

As a group the premature children were about 2 lb. lighter at age 2 and about 2½ lb. lighter at age 4, and about 1 in. shorter at both ages. Nevertheless, by 2 years 31 per cent. of them had caught up with their controls in weight and 44 per cent. in height, and by 4 years 36 and 44 per cent.,

respectively. There was some indication that children of birthweight 4 lb. or less were more successful in catching up by 4 years than others.

Study of the heights and weights in 1952 of the mothers of some 280 pairs showed that the mothers of the premature children tended, on the average, to be lighter and shorter than those of the controls; but mothers of children that caught up by 4 years were of normal height and weight.

Although 30 per cent. of the premature children and 11 per cent. of their controls were stunted (31 in. or less at 2 years and 38 in. or less at 4 years) or underweight (25 lb. or less at 2 years and 33 lb. or less at 4 years) or both, they contributed only a small proportion of the children of this type in the whole recorded population.—W. M. Deans.

3466

COLLINS, E. H. **The reciprocal nature of growth and behavior in the fetus and infant.** *Growth*, 1953, 17, 163-167. [Dept. Anat., Stritch Sch. Med., Loyola Univ., Chicago, Ill.]

Published data on bodyweight and fundamental activity from conception to 3 years of postnatal age have been used to show a reciprocal relationship between somatic and integrative growth in the human foetus and infant. It is suggested that the term infancy should be applied up to 3 years of age to include all the period of rapid growth.

F. C. Aitken.

3467

JASO, E., RIOS, S., ARBELO, A., BEJAR, J. and NAVARRO SAGRISTA, S. **Sobre biometría del lactante español. Estudio de la correlacion entre edades tallas y pesos para niños de una a cincuenta y tres semanas. [On the biometry of the Spanish infant. A study of the correlation between height and weight for age among children from one to fifty-three weeks.]** *Rev. española Pediat.*, 1953, 9, 1039-1047. [Esc. Sup. Estadíst. C.S.I.C., Madrid.] French, English and German summaries.

Weight and height of 1600 healthy infants from 1 to 53 weeks of age are plotted against the age in days, and equations are calculated showing the correlation of weight and height, respectively, with age. Other measurements will be dealt with later.—M. B. Richards.

3468

COTELLESA, G. and DE TONI, E. (Jr.) **La valutazione dello sviluppo scheletrico nell'infanzia e nell'adolescenza in condizioni normali e patologiche. [Evaluation of skeletal development in infancy and adolescence in normal and pathological conditions.]** *Pediatria*, 1953, 61, 872-888. [Ist. Clin. Pediat. G. Gaslini, Univ. Genoa.] English, Spanish, French and German summaries.

3469

SUAREZ, M. **Fisiopatologia de algunos estados de adaptacion en la infancia. [Physiopathology of some states of adaptation in infancy.]** *Rev. española Pediat.*, 1953, 9, 1019-1031. [Cat. Pediat. Puericult., Santiago de Compostela.] French, English and German summaries.

3470

MOURIQUAND, G. **Croissance, masse et dystrophies azotées chez l'enfant. [Growth, weight and nitrogen dystrophies in the child.]** *Pédiatrie*, 1953, 8, 877-898.

A review.

3471

HAHN, L. **Heights and weights in schoolboys aged 11 and 14 years in the City of Leicester (including percentiles of heights and weights), 1950-52.** *Med. Officer*, 1954, 91, 105-108. [Dept. School Health, Leicester.]

In the years 1950 to 1952, 472 boys of 11 years and 1700 of 14 to 15 years entering or leaving 2 grammar schools and 8 secondary modern schools in Leicester were weighed and measured in gym shorts and without shoes. For height the range, mean and S.E., and S.D. were 47 to 64, 56.48 ± 0.12 , 2.52 and 48 to 72, 62.65 ± 0.09 , 3.6 in. for the younger and older groups; for weight the corresponding figures were 48 to 130, 76.48 ± 0.51 , 11.0 and 55 to 180, 103.57 ± 0.45 , 18.94 lb. The values in cm. and kg. are also given. The heights were slightly above those found by Daley (Abst. 2237, Vol. 18) for London boys. Boys leaving the grammar schools were on the average about 2 in. taller and over 10 lb. heavier than those from the secondary modern schools in the poorer districts, but even the latter surpassed the figures for London 14-year-olds in 1938.—W. M. Deans.

3472

GARDINER, P. A. **The relation of myopia to growth.** *Lancet*, 1954, 266, 476-479. [Miller Gen. Hosp., London.]

Analysis of the records of myopic schoolchildren, 122 boys and 296 girls, and of a comparable number of controls showed that the former were taller and heavier than normal children of the same age, and the more myopic they were, the greater was the difference. In myopic girls menarche tended to be early. There was evidence that the growth changes came before the onset of myopia. The nature of the connection, if any, remains obscure.—W. M. Deans.

3473

ROBERTS, D. F. **Body weight, race and climate.** *Amer. J. Phys. Anthropol.*, 1954, 11, 533-558. [Lab. Anthropol., Dept. Human Anat., Oxford.]

N.A. and R., July 1954

A survey was made of world anthropometrical and physiological literature and 116 samples of populations, containing from 20 to 3000 males between the ages of 20 and 40, were taken for mapping and statistical analysis; the mean weights and heights of these samples are given in an appendix.

There was a significant negative correlation ($r = -0.600$) between mean weight and mean annual temperature, and this still held ($r = -0.538$) when height was taken into account. The prediction formula for mean weight was

$$W = 0.071S - 0.199T - 48.1,$$

where W is weight in kg., S height in mm. and T mean annual temperature in degrees F. The short series of 33 samples available of measurements of women [details not given] yielded similar results. There were also differences between racial groups after the effects of height and temperature had been eliminated, the lowest weights being found in groups thought to have occupied a tropical habitat for a long time.

Because of the failure of many anthropometrical workers to collect weights, the data are so scanty that they must be interpreted with caution. Variation in weight with temperature may be an adaptation advantageous in the adjustment of heat production and heat exchange to external conditions, and it may be that "there is a general weight level for given climatic conditions about which actual weights vary according to socio-economic and nutritional standards". In any case, weight norms based on European standards should not be used indiscriminately in nutrition and growth studies of other races in other parts of the world.—W. M. Deans.

3474

TOHARA, S. and MIYAKAWA, A. [Radiographical studies on the ossification of leg-bones in sheep.] *Bull. Nat. Inst. Agric. Sci., Chiba, Japan* [G], 1953, No. 7, 123-138. In Japanese: English summary.

Ossification of the leg bones of foetal and growing lambs was studied by X-rays.

All ossification centres of bone shafts appear from 1.5 to 2 months after conception and almost all centres at the ends of long bones between 3.5 and 5 months. At birth all ossification centres except that of the *sesamoides tertiae* are present if the foetus has developed normally. The ossification centres at the heads of the ulna and calcaneus are the last to appear and their absence at birth can be considered as indicative of faulty foetal development. Ossification centres at different parts of leg bones do not develop at the same rate. The times for completion of ossification of the ends of different bones are tabulated. (From summary.)—W. Godden.

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3475

SCHAEFFER, V. B. and WILKE, F. **Relative growth in the northern fur seal.** *Growth*, 1953, 17, 129-145. [U.S. Fish and Wildlife Serv., Seattle, Wash.]

Tables are presented showing bodyweight and length, hind flipper length, skull length and width of male and female seals (*Callorhinus ursinus*, L.) aged from newborn to over 10 years.

Newborn males weighed on the average 5.4 kg., females 4.8 kg. The average weight of males at maturity was 186 kg., which was $4\frac{1}{2}$ times the weight of mature females. Average body length of males was, newborn 659 mm., mature 1985 mm., and of females, newborn 631 mm., mature 1278 mm.—F. C. Aitken.

3476

LOWRANCE, E. W. **Roentgenographic record of skeletal growth in relation to age and body weight of the rabbit; calcaneus and tibia.** *Growth*, 1953, 17, 183-189. [Dept. Anat., Univ. Missouri, Columbia.]

Serial X-ray photographs were made of a mixed group of rabbits [the number is not given] from 15 to 134 days of age. The growth of calcaneus and tibia was studied and means, individual variations and relation to age and bodyweight are tabulated. Empirical formulae are offered for these relations.—D. Duncan.

See also Absts. 3544, 3561, 3599.

REPRODUCTION AND LACTATION: MAMMALS

3477

MARTIUS, H. Übertragung. [Prolonged gestation.] *Verhandl. Deutsch. Gesellsch. f. Gynäkol., Munich*, 7-11 October 1952; *Arch. Gynäkol.*, 1953, 183, 560-580 (with discussion 581-600). [Göttingen.]

A lecture review with many references.

3478

ALEXANDER, S. A. and DOWNS, J. T. III. **Influence of weight gain on pregnancy: a review of one thousand private cases.** *Amer. J. Obstet. Gynecol.*, 1953, 66, 1161-1167 (with discussion 1167). [Dallas, Tex.]

3479

PAEZ PUMAR, H., E. Glucosurias durante el embarazo. [Glycosuria in pregnancy.] *Arch. venezol. Nutricion*, 1952, 3, 329-333. [Inst. Nac. Nutrición.] English and German summaries.

Reducing substances were found in the urine in 27.8 per cent. of a group of 128 pregnant women. Blood sugar values were within normal limits

and no significant difference corresponded to the presence or absence of reducing substances in the urine. For 257 blood sugar estimations the average value was 0.88 per cent. Repetition of tests showed that the presence or absence of reducing substances in the urine was not constant for any individual.

It is considered that urine analysis is of doubtful value for the detection or control of diabetes in pregnant women.—M. B. Richards.

3480

RÖTTGER, H. Über den Wasserhaushalt in der physiologischen und toxischen Schwangerschaft. 1. Der Wasserhaushalt in der physiologischen Schwangerschaft. [Water metabolism in normal and toxæmic pregnancy. 1. Water metabolism in normal pregnancy.] *Arch. Gynäkol.*, 1953-54, **184**, 59-85. [Frauenklin., Med. Akad., Düsseldorf.]

The water volume of plasma and tissues was studied in 95 healthy women from the 2nd to the 10th month of pregnancy. Plasma volume was estimated photometrically after injection of a colloidal dye, and interstitial tissue water by the thiocyanate method. With advancing pregnancy, from about the 3rd month, a continuous increase was found in the water volume of both plasma and tissues. Plasma volume increased by 1093 ml. or 47.8 per cent., and extracellular water by about 4740 ml. or 35.7 per cent. Of the average body-weight increase during pregnancy, 49.3 per cent. is ascribed to increased water volume.

By the 9th day after delivery both plasma and extracellular water volume were considerably reduced, though not normal.—M. B. Richards.

3481

HUTCHINSON, D. L., PLENTL, A. A. and TAYLOR, H. C. (Jr.) The total body water and the water turnover in pregnancy studied with deuterium oxide as isotopic tracer. *J. Clin. Invest.*, 1954, **33**, 235-241. [Dept. Obstet., Coll. Phys. Surg., Columbia Univ., New York.]

Total body water was estimated at least once during pregnancy in 6 healthy women. In preliminary experiments it was found that the concentration of injected D_2O in serum reached equilibrium in from 2 to 3 hr. The constant for the curve of disappearance of D_2O from serum after initial equilibrium was found and from it the following values were calculated: total turnover = (total body water) (disappearance constant) (100); half-life time = 0.693/disappearance constant; turnover time = 1.00/disappearance constant.

During normal pregnancy there was an absolute rise in total body water and total solids. In the

early puerperium, as compared with early pregnancy, there was a relative loss of total body water and a relative gain in total body solids. In normal pregnancy, the disappearance constants and turnover rates were found to be within the limits reported for normal non-pregnant females. In patients with pre-eclampsia, water turnover rates were below normal and in hypertension they were normal or higher.—A. M. Thomson.

3482

BRUCE, H. M. Feeding and breeding of laboratory animals. 14. Size of breeding group and production in mice. *J. Hyg.*, 1954, **52**, 60-66. [Nat. Inst. Med. Res., Mill Hill, London, N.W.7.]

3483

SANYAL, S. N. and GANGULY, A. K. Sterility effect of *Pisum sativum* (Linn). 8. Spectrophotometric study.

SANYAL, S. N. 9. Biological studies. 10. Chemical study. *Calcutta Med. J.*, 1953, **50**, 409-412; 413-414; 415-418. [Calcutta Bacteriol. Inst.]

For earlier parts, see Absts. 288, 2437, Vol. 21; 2621, Vol. 22; 2074, Vol. 23.

8. Ultraviolet spectrophotometric studies of the action of *m*-xylohydroquinone have been extended with pure progesterone and pregnanediol made available since the earlier work. Progesterone is reduced by *m*-xylohydroquinone but vitamin E counteracts the effect.

9. Experiments on female rats were repeated with *m*-xylohydroquinone in place of oil of *Pisum sativum* used in earlier investigations (Abst. 288, Vol. 21). When given within 8 days of conception it caused death and resorption of foetuses; when given after the 10th day of gestation there was no effect and normal young were born. The adverse effect was counteracted when vitamin E was given along with the *m*-xylohydroquinone in the early stage.

10. The diacetyl and monobenzoyl compounds of *m*-xylohydroquinone were prepared by methods which are described and were given to immature female rats. It was found that the diacetyl compound is stable but the monobenzoyl is easily broken down to liberate the *m*-xylohydroquinone. There was no evidence of toxicity.—D. Harvey.

3484

ISBISTER, C. A clinical study of the draught reflex in human lactation. *Arch. Dis. Childhood*, 1954, **29**, 66-72. [Unit Clin. Invest., Royal North Shore Hosp., Sydney.]

N.A. and R., July 1954

Observation of 241 mothers indicated that the presence of the draught or let-down reflex is essential to successful lactation. The pattern of the draught reflex and reactions to it by the baby are described.—F. C. Aitken.

3485

NIKITIN, V. N., TVERDUN, O. G. and DOKTOROVICH, N. L. Periodika sekretornogo protsessa v vyeni. [The periodicity of milk secretion of the udder.] *Zh. Obshchei Biol.*, 1953, **14**, 275–289. [Ukrain. Inst. Zhivot.]

A new concept is advanced for the active regulation of the capacity of the udder by the nervous system, and for the significance of nervous receptors in the udder in the process of milk secretion. As a working hypothesis it is assumed that the formation of milk and particularly of milk fat after milking depends on the total increase in the "trophic tone" of the udder and on centres in the central nervous system. The partial removal of the layer of fat globules adsorbed on the alveolar epithelium which occurs during milking may have additional significance. A decrease in the rate of milk secretion, particularly that of fat, before milking depends on a decrease in the nervous impulses and also on the accumulation of fat globules on the alveolar epithelium.—W. Hughes.

3486

FOURNIER, P. and SUSBIELLE, H. Étude de l'influence de la lactation sur l'état des os longs de la rate. [Effect of lactation on the long bones of the rat.] *J. Physiol., Paris*, 1953, **45**, 547–558. [Lab. Physiol. Nutrit., École Hautes-Études, Paris.]

Female rats aged about 7 months, which had had one litter, received daily 13 g. of a diet supplying 500 mg. Ca and 500 mg. P per 100 g. diet. Lactating females received a high-energy supplement. The 6 initial controls were killed on the day on which the 5 experimental rats were mated. The latter had litters which were weaned at 21 days, when the mothers and 6 further unmated controls were killed.

The long bones of the lactating group had a mean total weight of 1068 mg., compared with 1301 and 1386 mg. for initial and final controls, respectively, a highly significant loss. The loss from the femur was 27, from the tibia 20 and from the humerus 19 per cent. The losses of Ca and P were also about 23 per cent., the ratio remaining unchanged, as in the main did the percentage Ca and P composition of the bones. The loss of bone tissue is therefore one of resorption and not of demineralisation. The process of resorption is discussed, and it is concluded from the results of other work that when Ca intake is insufficient resorption may be accompanied by demineralisation.

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tion. It is thought premature to conclude from existing work that the skeletal loss is inevitable.

D. Duncan.

3487

FOURNIER, P., SUSBIELLE, H. and BOURDEAU, A. Effet du régime alimentaire sur l'état du squelette de la rate en lactation. [Effect of diet on the skeleton of the rat during lactation.] *J. Physiol., Paris*, 1953, **45**, 655–662. [Lab. Physiol. Nutrit., École Hautes-Études, Paris.]

The rats were 7 months old at the beginning of the experiment and each had had one litter. Eight were unmated as controls and the rest were mated and divided into 2 groups of 6 and one of 7. After parturition they received the experimental diets, given to appetite. The first was that used in an earlier experiment (see preceding Abst.), the second supplied similar amounts of the principal nutrients but contained a considerable proportion of dried and fresh milk; the third was high in energy value, and contained 36 per cent. protein and 17.2 per cent. fat. All 3 contained the same amounts of Ca and P, and each contained TiO_2 . At the end of lactation the weights of the femurs, tibiae and humeri were compared with those of the unmated rats.

The rats on the ordinary and high-energy diets lost in 20 days of lactation 17 and 19 per cent., respectively, of the weight of the long bones, but those on the milk diet lost only 8 per cent. The losses of bone tissue per young rat reared were 28, 31 and 13 mg., respectively. The protective effect of milk was thus considerable.—D. Duncan.

3488

FOURNIER, P., SUSBIELLE, H. and BOURDEAU, A. Influence de la composition du régime sur le métabolisme calcique de la rate allaitante. Contribution à l'étude de la physiologie de l'os. [Effect of the composition of the diet on calcium metabolism of the lactating rat. Contribution to the study of the physiology of bone.] *J. Physiol., Paris*, 1953, **45**, 723–737. [Lab. Physiol. Nutrit., École Hautes-Études, Paris.]

The rats were those described in the preceding Abstract.

The Ca content of the litters at weaning, assuming equal utilisation of the milk by all the young, indicated the total amount of Ca secreted in the milk; it was not significantly different in the 3 groups. The urinary output of Ca was small, and the greater part of the Ca absorbed was eliminated in the milk. The net absorption of Ca was 2.21 g. in the rats on milk diet, and 2.02 and 1.90 g., respectively, on the ordinary and high-energy diets. The daily absorption increased steadily from about 7 mg. before parturition to 190 mg. at the end of lactation. The coefficient of absorption also increased, especially in the rats on milk diet.

The mean Ca balance was negative in all groups, but least on milk diet, in which group 3 of the 7 rats had positive balances.

The mechanism of the protective effect of milk is discussed, and its value is ascribed to the presence of lactose.—D. Duncan.

3489

FOURNIER, P. and SUSBIELLE, H. Le comportement des os longs de la rate pendant la lactation. Influence de la quantité ingérée de régime équilibré. [**Behaviour of the long bones of the rat during lactation. Effect of the amount of a balanced diet ingested.**] *C.R. Soc. Biol.*, 1953, **147**, 1588-1591. [Lab. Physiol. Nutrit., École Hautes-Études, Paris.]

Rats aged 7 months were given during second pregnancy and lactation a well-balanced diet; one group was allowed the diet to appetite, the other group received 13 g. per rat daily, with a carbohydrate supplement to supply energy needs during lactation. The first group ate about 40 g. per rat daily, and had thus about three times as much mineral, protein and B vitamins as the others.

At weaning the restricted rats had lost on the average 21 g. bodyweight, but the unrestricted rats had gained about 4 g. Their litters weighed on the average 191 and 327 g., respectively. The loss of weight from the long bones was 23 and 19.3 per cent., respectively, or 35 and 30 mg. for each young rat weaned.

It is concluded that the loss of skeletal weight during lactation is little influenced by the intake of minerals, protein or vitamins of the B complex.

D. Duncan.

3490

FOURNIER, P. Nature et conséquences du prélèvement effectué par la rate allaitante sur son squelette. [**Nature and effects of resorption from the skeleton of the lactating rat.**] *C.R. Acad. Sci.*, 1954, **238**, 270-272.

See above Absts. The author again insists that it is premature to conclude that the loss of skeletal weight during lactation is inevitable.—D. Duncan.

3491

FOURNIER, P. L'effet protecteur du lait vis-à-vis de la résorption des os de la rate allaitante. [**Protective effect of milk against bone resorption in the lactating rat.**] *C.R. Acad. Sci.*, 1954, **238**, 391-393.

In continuation of earlier work (see above Absts.) rats were pair-fed. Group 1 received to appetite an ordinary diet based on wheat and casein, group 2 received equivalent quantities of the principal nutrients in the form of a diet based on milk.

After a lactation rats of group 1 had long bones weighing 17 per cent. less than those of non-lac-

tating controls, and contained 19 per cent. less total Ca, representing a loss of 330 mg. The losses in group 2 were 8 and 4 per cent. and 70 mg., respectively.

It is concluded that milk contains some substances which affects bone metabolism in such a way as to reduce the drain due to lactation.

D. Duncan.

3492

FOURNIER, P. L'effet protecteur du lactose vis-à-vis du squelette de la rate allaitante. [**Protective effect of lactose on the skeleton of the lactating rat.**] *C.R. Acad. Sci.*, 1954, **238**, 509-511.

Two groups of rats received to appetite during lactation diets with a basis of wheat and casein, the difference being that one contained 12 per cent. starch and the other 12 per cent. lactose.

The rats on the ordinary diet lost in 19 days of lactation 250 mg. Ca on the average, about 15 per cent. of the total Ca of non-lactating controls. Seven of the 8 rats had strongly negative Ca balances; the eighth was in equilibrium. The lactose diet completely prevented this loss of Ca, rats gaining on the average 18 mg. Ca during the lactation. Two had slightly negative balances, 2 were in equilibrium and 3 had positive balances.

The means by which lactose exerts this favourable influence are not understood.—D. Duncan.

See also Absts. 2961, 2983, 3187, 3189, 3194, 3205, 3206, 3213, 3279, 3405, 3406, 3447, 3509, 3510, 3760, 3793, 3808, 3809, 3811, 3812.

REPRODUCTION: BIRDS

3493

McCALLION, D. J. A cytological and cytochemical study of the shell gland of the domestic hen. *Canad. J. Zool.*, 1953, **31**, 577-589. [Perry Biol. Labs., Acadia Univ., Wolfville, N.S.]

3494

TYLER, C. and GEAKE, F. H. Studies on egg shells. 3. Some physical and chemical characteristics of the egg shells of domestic hens. *J. Sci. Food Agric.*, 1953, **4**, 587-596. [Dept. Agric. Chem., Univ. Reading.]

Statistical analysis of the results of detailed physical and chemical studies of 50 eggs from 14 Rhode Island Red × Light Sussex hens showed highly significant differences between birds except for Ca, carbonate and Mg. Mean values for the N-free shell were Ca 38.7, carbonate as CO₂ 42.9, Mg 0.59, P 0.13 and citric acid 0.11 per cent. Total shell Ca (X) and shell weight including membranes (Y) were related by the regression equation

$$X = 0.374Y - 0.072,$$

which could be used to save time and trouble in

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mineral balance experiments on poultry. Citric acid (Y) and total shell protein (X) were related by the regression equation

$$Y = 0.09X - 1.56.$$

W. M. Deans.

3495

WILLIAMS, M. A., DACOSTA, W. A., NEWMAN, L. H. and MARSHALL, L. M. **Free amino-acids in the yolk during the development of the chick.** *Nature*, 1954, **173**, 490. [Dept. Biochem., Sch. Med., Howard Univ., Washington, D.C.]

The free amino-acid content of the yolks of incubating eggs rose from about $0.7 \mu M$ per g. at

3 days to a maximum of $4.5 \mu M$ per g. at 9 days and fell to $1.1 \mu M$ per g. at 12 days. The proportions of the amino-acids varied from time to time, presumably because of different rates of use.

C. Warner.

See also Abst. 3273.

SENESCENCE

3496

Appunti di fisiologia alimentare. [Observations on alimentary physiology. 1. Funzione protettiva in rapporto all'età. [1. Protective function in relation to age.] 2. Il bilancio proteico nell'anziano. [2. Protein balance in old age.] *Acta gerontol.*, 1953, **3**, No. 3/4, 36-39; 40-43.

EXPERIMENTAL STUDIES OF IMMUNITY AND MICRO-ORGANISMS

3497

RASMUSSEN, A. F. (Jr.), WEAVER, R. W., ELVEHJEM, C. A. and CLARK, P. F. **Influence of low tryptophan diets containing 6-methyltryptophan on oral infection with poliomyelitis virus.** *Proc. Soc. Exp. Biol. Med.*, 1953, **84**, 306-308. [Dept. Med. Microbiol., Univ. Wisconsin, Madison.]

It is concluded that 6-methyltryptophan is not antagonistic to tryptophan in monkeys. From other investigations in which poliomyelitis virus was given to monkeys to drink in sweetened suspension there was evidence that the incubation periods were longer than in control animals and that when a smaller dose was given, the incidence of paralysis was lower in animals having 2 per cent. 6-methyltryptophan in their diet.—D. Harvey.

3498

HUMMELER, K., GYÖRGY, P., HOOVER, J. R. E. and KUHN, R. **Fractions of human milk and virus multiplication.** *Science*, 1953, **118**, 781-782. [Dept. Paediat., Sch. Med., Univ. Pennsylvania, Philadelphia.]

3499

HAWKING, F. **Milk, *p*-aminobenzoate, and malaria of rats and monkeys.** *Brit. Med. J.*, 1954, **i**, 425-429. [Nat. Inst. Med. Res., Mill Hill, London, N.W. 7.]

For the preliminary communication see Abst. 4301, Vol. 23.

Suppression of *Plasmodium berghei* infection by milk diet was more effective in rats weighing 200 g. than in younger animals. Chloramphenicol, 1 in 20,000, or folic acid, 1 in 10,000, or *p*-aminobenzoate, 1 in 40,000, added to the milk allowed the malaria infection to develop as well as in rats on stock diet. Smaller concentrations of *p*-aminobenzoate were sometimes effective. Methion-

ine, *p*-hydroxybenzoate and vitamin B_{12} were ineffective.

Plasmodium knowlesi infection failed to develop in a monkey on milk diet, but developed in 2 others which received *p*-aminobenzoate, 1 in 10,000 and 1 in 1 million, respectively, in the milk.

In suckling rats *P. berghei* infections developed much more rapidly and intensely when *p*-aminobenzoate was supplied by intraperitoneal injection to the babies or the mother or was smeared on the mother's nipples. Similar results were obtained for breast- or bottle-fed baby monkeys with *P. cynomolgi* infection.

The functions of *p*-aminobenzoate are discussed. It is suggested that the relative immunity to malaria of babies in the tropics may be due to deficiency of *p*-aminobenzoate in breast milk.

D. Duncan.

3500

RAMAKRISHNAN, S. P. **Studies on *Plasmodium berghei* N. Sp. Vincke and Lips, 1948. 8. The course of blood-induced infection in starved albino rats.**

RAMAKRISHNAN, S. P., PRAKASH, S., KRISHNASWAMI, A. K. and SINGH, C. **9. Effect of milk diet on the course of blood-induced infection in albino rats.** *Indian J. Malariol.*, 1953, **7**, 53-60; 61-65. [Malaria Inst. India, Delhi.]

8. Adult rats were starved for from 5 to 10 days and were inoculated with one million parasites on the first or sixth day. Others were inoculated and maintained on a standard diet. After the fast they were fed and watched for another 16 days. Parasites were counted in the blood at regular intervals.

The development of the parasites was adversely affected by the host's fasting, and after 10 days' starvation with inoculation on the first day none ever appeared; after 5 days' starvation with inoculation on the first day they appeared and

were present for 10 days. When the inoculation took place after 5 days' fasting no parasite ever appeared, but when such an inoculation was followed at once by feeding, the parasites developed normally after a slow start. Alternating periods of 5 days' fasting and feeding caused the infection to become latent.

In younger rats the inhibiting effect of starvation was less.—E. M. Hume.

9. Small groups of rats were fed on a whole diet of milk or on diets of the same energy value, one containing some milk, the other none. The animals were fed on the milk diet or the stock diet for a week before being inoculated and allotted to the different diets. In the blood of the rats on the pure milk diet the parasites persisted for a shorter time, and the average parasite count and peak count were lower, than in the blood of the animals on the other diets; consumption of the milk diet beforehand enhanced the effect. It is suggested that for optimum multiplication malarial parasites in rats require some substance or substances not present in milk.—L. Wills.

3501

KLEMENCIC, F. and SJÖSTRÖM, B. Der Einfluss von Dextran-(MacroDEX) infusionen auf die Antikörperbildung bei Kaninchen. [Effect of dextran (MacroDEX) infusions on antibody formation in the rabbit]. *Acta Soc. Med. upsalien.*, 1953, **59**, 12-16. [Akad. Krankenhaus, Upsala.]

Dextran infusions given to rabbits with or before Pneumococcus-I vaccine were without effect on antibody formation.—M. B. Richards.

3502

HARTLES, R. L. and WASDELL, M. R. The metabolism of the oral flora. 2. The oxidation of some sugars by mixed human saliva. *Biochem. J.*, 1954, **56**, 353-355. [Dept. Biochem., Sch. Dent. Surg., Univ. Liverpool.]

3503

LONG, D. A. Influence of protein metabolism on bacterial allergy. Its relation to cortisone desensitisation. *Lancet*, 1954, **266**, 231-234. [Nat. Inst. Med. Res., London.]

Groups of 10 guineapigs were fed on Bruce and Parkes' diet 18 (Abst. 138, Vol. 17) or on this diet with 5 per cent. skimmed milk replacing part of the grassmeal (diet 18A), with or without unlimited cabbage. They were injected with B.C.G. vaccine and their sensitivity to tuberculin was estimated.

Diet 18 is deficient in ascorbic acid, but diet 18A produced no evidence of deficiency after 4 months. Cortisone injected 6 hr. before the tuberculin depressed sensitivity in animals on diet 18 but not

in those on 18A. Additional ascorbic acid, purified or in cabbage, had a slight effect alone, but a large effect in the presence of cortisone. The skimmed milk in diet 18A antagonised desensitisation by ascorbic acid, and methionine added to diet 18 had a similar effect. Ethionine facilitated desensitisation by ascorbic acid, but this in turn was inhibited by reduced glutathione. Ethionine did not influence sensitivity in ascorbic acid deficiency.

The analogy between the actions of cortisone and of alloxan is discussed. The hypothesis is put forward that cortisone interferes with glutathione formation in the course of a general interference with protein synthesis; the resulting fall in glutathione facilitates the oxidation of ascorbic acid to dehydroascorbic acid, the latter inactivating phosphoglucomutase and increasing the tissue concentration of glucose-1-phosphate, intimately concerned with desensitisation.—D. Duncan.

3504

MANN, S. O., MASSON, F. M. and OXFORD, A. E. Facultative anaerobic bacteria from the sheep's rumen. *J. Gen. Microbiol.*, 1954, **10**, 142-149. [Rowett Res. Inst., Bucksburn, Aberdeenshire.]

A study was made of facultative anaerobes in cultures obtained by Heald and others (Abst. 2213, Vol. 24) from the rumen of a sheep fed on hay, and from the hay itself.

Among 120 streptococcal isolates belonging to Lancefield's Group D, 82 per cent. resembled *Streptococcus bovis* and 6 percent. *Str. faecalis*; the latter were also obtained from old hay. Staphylococci and coliform bacilli were also isolated, the latter mostly of intestinal type. A large Gram-negative coccus earlier photographed by Baker *et al.* (Abst. 2464, Vol. 21) was isolated and named *Sarcina bakeri*. It fermented glucose and produced acid, but no gas.—D. Duncan.

3505

MACLEOD, R. A. and BRUMWELL, C. Cellulose digestion by rumen micro-organisms and its stimulation by fishery by-products. *Fish. Res. Board Canada, Progr. Rep. Pacific Coast Stat.*, 1953, No. 96, 16-20. [Pacific Fish. Exp. Stat.]

The addition of whale or herring solubles to cellulose fermenting in media inoculated with rumen contents increased its digestion to the same extent as did a mixture of 18 amino-acids. N was maintained at a level of 24 mg. in 40 ml., the pH was kept between 6.8 and 7.0 and incubations lasted for from 70 to 120 hr. [apparently under aerobic conditions].—A. T. Phillipson.

3506

LEWIS, D. The reduction of sulphate in the rumen of the sheep. *Biochem. J.*, 1954, **56**, 391-399.

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[Agric. Res. Counc. Unit Microbiol., Univ. Sheffield.]

Reduction of sulphate to sulphide was shown to occur in the rumen of the sheep and in washed suspensions of mixed rumen bacteria *in vitro*. Both in the sheep and *in vitro* repeated additions of sulphate resulted in formation of concentrations of sulphide. The optimum pH for the reaction was 6.5. Sulphite and thiosulphite were similarly reduced, with H uptake and sulphide production within the range of 70 to 100 per cent. of the theoretical values. Glucose, formate, fructose, lactate, pyruvate, succinate, ethanol, citrate and malate proved to be hydrogen donors, as well as H₂ gas. After fractionation of the rumen bacteria, the smaller organisms caused more rapid reduction than the larger.—A. T. Phillipson.

3507

PRIER, J. E. **Studies on toxic factors produced by rumen microorganisms of sheep.** *Amer. J. Vet. Res.*, 1954, **15**, 51–54. [Dept. Vet. Sci. Bacteriol., Wyoming Agric. Exp. Stat., Laramie.]

Rumen samples were taken from sheep, alive or dead, which had shown clinical signs of indigestion. Cultures were made in a fluid thiol (Difco) medium. After 10 to 12 days' incubation the medium was filtered off. Single colonies were picked off from agar plates grown in the same medium. The effects obtained from pure or mixed cultures that produced physiologically active substances were either an increase of 10 to 100 or a decrease of 20 to 140 mm. Hg in the blood pressure of sheep and dogs.—A. T. Phillipson.

3508

RAVEL, J. M., WOODS, L., FELSING, B. and SHIVE, W. **Some interrelationships of aspartic acid, threonine, and lysine.** *J. Biol. Chem.*, 1954, **206**, 391–400. [Biochem. Inst., Univ. Texas, Austin.]

In the presence of biotin, lysine, threonine and bicarbonate *Lactobacillus arabinosus* did not require aspartic acid for growth. In the absence of these substances, Tween 80 being substituted for biotin, aspartic acid was required; the requirement was reduced by any one or, better, by a combination of two or more of these substances. With *L. casei* results were similar, except that lysine was indispensable at all times.

Lysine, threonine or both together were, in that order, increasingly effective in protecting *L. arabinosus* against the inhibition of aspartic acid utilisation produced by cysteic acid; similar results were obtained with threonine and *L. casei*.

Threonine was about twice as effective as *allo*-threonine and 5 or 10 times as effective as homo-serine or the lactone of γ -hydroxy- α -ketobutyric

acid in replacing aspartic acid for both organisms; succinic, fumaric, malic and oxaloacetic acids were ineffective. Asparagine could replace aspartic acid for *L. casei*, but not to any extent for *L. arabinosus*.

Biocytin, α - ϵ -diaminopimelic acid, α -amino-adipic acid or α -amino- ϵ -hydroxycaproic acid did not replace lysine.—C. Warner.

3509

GYÖRGY, P., NORRIS, R. F. and ROSE, C. S. ***Bifidus* factor. 1. A variant of *Lactobacillus bifidus* requiring a special growth factor.**

GYÖRGY, P., KUHN, R., ROSE, C. S. and ZILLIKEN, F. **2. Its occurrence in milk from different species and in other natural products.**

GYÖRGY, P., HOOVER, J. R. E., KUHN, R. and ROSE, C. S. **3. The rate of dialysis.**

GAUHE, A., GYÖRGY, P., HOOVER, J. R. E., KUHN, R., ROSE, C. S., RUELIUS, H. W. and ZILLIKEN, F. **4. Preparations obtained from human milk.** *Arch. Biochem. Biophys.*, 1954, **48**, 193–201; 202–208; 209–213; 214–224. [Dept. Paediat., Univ. Pennsylvania, Philadelphia.]

1. *Lactobacillus bifidus* var. *Penn*, which requires an unknown growth factor present in human milk, was shown to be morphologically identical with but serologically different from the regular strains of *L. bifidus* tested. The metabolic pattern of the strains was the same except for the requirement of the human milk growth factor and the inability of the variant to use maltose in place of lactose for growth.

2. Relatively good sources of the growth factor were human and rat's colostrum, human milk, rat's milk, cow's and sow's colostrum and cat's milk. Poor sources were the milk of ruminants, cow, ewe and goat. The potencies of milks of monkey, dog, donkey, rabbit, mare and sow were intermediate. The growth factor was found in high concentration in human saliva, semen, amniotic fluid, meconium and tears. Pig gastric mucin was a rich source. Ammonium salts, *N*-acetylglucosamine and *N*-acetylgalactosamine were active.

3. The growth factor could be separated into a dialysable fraction having from 40 to 75 per cent. of the activity and a relatively non-dialysable fraction of 25 to 60 per cent.

4. Cream, proteins, salts and lactose were removed and bifidus-active N-containing oligo- and polysaccharides were obtained from the lactose-free active concentrates. By chromatography 4 different active components were found; all contained *N*-acetylglucosamine. Three were laevorotatory. N-free saccharides obtained from the lactose-free concentrates were inactive.

F. C. Aitken.

3510

TOMARELLI, R. M., HASSINEN, J. B., ECKHARDT, E. R., CLARK, R. H. and BERNHART, F. W. **The isolation of a crystalline growth factor for a strain of *Lactobacillus bifidus*.** *Arch. Biochem. Biophys.*, 1954, **48**, 225-232. [Wyeth Labs., Inc., Nutrit. Div., Mason, Mich.]

Seven strains of *Lactobacillus bifidus* which required an unknown growth factor present in human milk but not in enzymic digest of casein were isolated. The relative growth-promoting activities of human milk and other substances for one of these strains are tabulated. Pig gastric mucin was a rich source. From the acid-hydrolysed mucin was isolated an active disaccharide tentatively identified as galactose-acetylglucosaminide.—F. C. Aitken.

3511

PETERS, V. J. and SNELL, E. E. **Peptides and bacterial growth. 6. The nutritional requirements of *Lactobacillus delbrueckii*.** *J. Bacteriol.*, 1954, **67**, 69-76. [Biochem. Inst., Univ. Texas, Austin.]

3512

KOROTKOVA, G. P. O toksicheskikh svoistvakh "belka" i "lizotsima" kurinova yaitsa.

[Toxic properties of white and lysozyme of the hen's egg.] *Dokl. Akad. Nauk. S.S.S.R.*, 1953, **92**, 197-200. [Leningrad Gosud. Univ.]

The effect of egg white and lysozyme extracted from it was studied on *Glaucoma scintillans* and *Paramecium caudatum*. It was found that the paramecium died in the white on the average in 27.8 min. and *Glaucoma* in 6.3 min.; the corresponding times for lysozyme were 14.8 and 8.5 min. There were differences in the morphological changes accompanying the death of the ciliates in the white and in lysozyme. White and lysozyme from eggs laid during the spring and summer were more toxic than those from eggs laid in autumn and winter. The highest toxicity was shown by liquid white from the inner layer, in which *Glaucoma* lived only 4.44 ± 0.32 min. Large variations in the toxicity of the white and lysozyme were also shown for *Trichomonas vaginalis*, *Lambliia intestinalis*, *Pelmatohydra olygactis*, *Aeolosoma*, *Physa fontinalis*, rat spermatozoa, zoospores of *Phytophthora infestans* and *Elodea* leaves. The white is not toxic to the tissue of the chick embryo itself. It is concluded that the white and the lysozyme prepared from it are not identical in their effects.

W. Hughes.

See also Absts. 3051, 3169.

MISCELLANEOUS FEEDING EXPERIMENTS

3513

GRIFFITHS, W. J. (Jr.) and GALLAGHER, T. J. **Differential dietary choices of albino rats occasioned by swimming.** *Science*, 1953, **118**, 780. [Dept. Psychol., Univ. Mississippi, Oxford.]

For 14 days rats were allowed to swim for about 1 hr. 50 min. daily or until distress was evident. During this and a preliminary period without swimming they had access to solutions of glucose and saccharine. During the exercise period they increased significantly their intake of glucose and decreased, by an amount not statistically significant, that of saccharine.—D. Harvey.

3514

BALDISSERA NORDIO, C. **Variazioni emocitometriche nei ratti trattati con *Allium cepa*.** [Variations in the numbers of blood cells from rats treated with *Allium cepa*.] *Boll. Soc. ital. sper.*, 1953, **29**, 985-986. [Ist. Zootec. Gen., Fac. Agrar., Univ. Milan.]

Eight rats fed on a mixture of grains were given in addition 6 or 20 g. cooked onion per kg. body-weight daily for 20 days. Every 3 days blood counts were made and Hb was estimated. The percentage of Hb and the number of red cells

diminished, and hyperchromic anaemia was established. There was little change in the white cell count.—E. M. Hume.

3515

REID, M. E. and BRIGGS, G. M. **Development of a semi-synthetic diet for young guinea pigs.** *J. Nutrition*, 1953, **51**, 341-354. [Nat. Inst. Arthritis Metabol. Dis., Nat. Inst. Health, Bethesda, Md.]

A semi-synthetic diet based on casein, maize oil, sucrose, cellophane, maize starch, cerelose, K acetate, MgO, salts and vitamins has been developed for guineapigs. It has a greater variety of carbohydrates and a higher content of vitamins and minerals than diets previously used. Animals given the diet at from 2 to 4 days of age and maintained on it to 150 days grew almost as well as those on a good commercial pelleted diet, and were normal in weight, general appearance, physical activity, appearance and weight of internal organs, haematocrit and granulocyte and total leucocyte counts. Preliminary results indicate that the diet supports reproduction, although it appears to be less satisfactory for this function than for growth. The diet can be used for evaluating vitamin requirements.—M. B. Richards.

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3516

FINK, H., SCHLIE, I. and RUGE, U. Eine neue Diät zur Auslösung der alimentären Lebernekrose bei jungen Albino-Ratten (Champignon-Diät). [A new diet for the production of alimentary liver necrosis in young albino rats. Mushroom diet.] *Hoppe-Seyler's Ztschr.*, 1953, 293, 264-267. [Inst. Garungswissenschaft, Univ. Cologne.]

See Abst. 2073, Vol. 24.

3517

ABBOTT, O. D., FRENCH, R. B. and TOWNSEND, R. O. Effect of processing upon the nutritive value of milk as evaluated with rats. *Florida Agric. Exp. Stat. Bull.* No. 485, November 1951, pp. 12.

The milks tested were raw and pasteurised, obtained from 2 sources and fresh or aged for 4 days; non-fat milk solids fresh or aged for several summer months without refrigeration; and evaporated milk. They were given to weanling albino rats in groups of 6 for from 10 to 13 weeks in a diet consisting of two-thirds ground whole hard spring wheat and one-third milk. Vitamin A and fat were added to the diets containing non-fat milk solids to bring the levels to those in whole fluid milk.

The results are presented in graphs. On the basis of weight, reproductive performance and skeletal mineralisation in the rats, no significant difference was found in the nutritive values of the milks. The nutritive value of whole milk from one source was reduced by unidentified factors not related to the processing, and not destroyed by pasteurisation. The nutritive value of the non-fat milk solids diet was reduced when aged solids were given with slightly rancid vegetable oil. Butter could successfully replace vegetable oil in the non-fat milk solids diet.—P. C. Jowsey.

3518

ABBOTT, O. D., FRENCH, R. B. and TOWNSEND, R. O. The nutritive value of various breads and supplements in experiments with white rats. *Florida Agric. Exp. Stat. Bull.* No. 483, September 1951, pp. 22.

Five breads were used: water bread (unenriched white bread); enriched water bread (enriched according to the present regulations); milk bread (white bread containing 6 per cent. non-fat milk solids by weight of flour and unenriched); enriched milk bread; and whole wheat bread made from 100 per cent. extraction flour, without milk.

The composition of the 5 breads, in the above order, was: crude protein 13.05, 13.16, 14.00, 14.00, 15.14; ash 1.83, 1.84, 2.94, 2.94, 3.34 [presumably

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per cent. but not stated]; vitamin B₁ 0.29, 1.36, 0.29, 1.36, 1.75; riboflavin 1.55, 2.35, 1.74, 2.54, 0.80; nicotinic acid 6.01, 17.64, 5.13, 17.17, 17.80 mg. [per 100 g.?] all on an 8.2 per cent. moisture basis.

In all the feeding experiments with 3-week-old albino rats, one control group received a stock diet and the other groups each had one of the breads plus fat to bring the fat content of the diet to 10 per cent., and vitamin A at the rate of 200 I.U. per rat daily.

In the first test, the mothers received a water bread diet when the young were from 12 to 15 days old. The quality of the milk appeared to be affected, and at 21 days the young weighed on the average 32 g. instead of the 38 to 40 g. usual for this age. After 13 weeks on the test diets young rats given whole wheat or either type of milk bread were superior in size and condition to the rats given the water breads, but were not comparable to those given the stock diet. It was thought that the water bread diet of the mothers during lactation may have contributed to this result, and in a second experiment the mothers were allowed stock diet until the young were placed on test at 21 days of age. The results were similar to those of the first test, and no significant advantage of enrichment could be demonstrated.

Supplementation of the 2 water breads with protein in the form of non-fat milk solids to levels of 15.3 and 18.0 per cent. resulted in more normal growth curves, but even then no advantage of enrichment could be demonstrated.

The limiting factor in bread appeared to be protein, but tests with purified casein showed that some substance which makes possible the more effective utilisation of protein had been removed in purification. Aureomycin and vitamin B₁₂ supplied this, and rats given this supplement with a diet of water bread and casein grew better than those given the diet of water bread and casein alone.

The lack of response to the standard enrichment of water bread indicated that enrichment is of doubtful value, but it is considered that the enrichment of bread with non-fat milk solids should be further investigated.—P. C. Jowsey.

3519

WOMACK, M., MARSHALL, M. W. and SUMMERS, J. C. Cottonseed food supplement. Nutritive value of bread and cookies containing cottonseed flour. *J. Agric. Food Chem.*, 1954, 2, 138-140. [Bur. Human Nutrit., Agric. Res. Admin., U.S. Dept. Agric., Washington 25, D.C.]

Breads or cookies were given as sole source of protein to groups of 12 weanling littermate rats.

for 28 days. Bread made from 10 parts cottonseed flour to 100 parts white wheat flour gave greater gains than equal amounts of bread made without cottonseed flour. Nitrogen efficiency was greater with the cottonseed flour bread when the breads yielded a 10 per cent. protein level in the ration. Bread made with 4 parts non-fat milk solids and 8 parts cottonseed flour to 100 parts white flour gave greater gains in weight than equal amounts of bread made with milk solids and without cottonseed flour. Nitrogen efficiencies were not significantly different at the 10 per cent. protein level.

Growth of rats given cookies of oatmeal and white flour with or without cottonseed flour replacing 21.5 parts of the flour was poor.

F. C. Aitken.

3520

SUBRAHMANYAN, V., MURTHY, H. B. N. and SWAMINATHAN, M. **Effect of partial replacement of rice, wheat or ragi (*Eleusine coracana*) by tuber flours on the nutritive value of poor vegetarian diets.** *Brit. J. Nutrition*, 1954, **8**, 1-10. [Central Food Technol. Res. Inst., Mysore.]

Groups of 6 rats about 4 weeks old and weighing from 40 to 55 g. were given diets containing raw milled rice, whole wheat flour, or ragi (*Eleusine coracana*) 75, tur dhal (*Cajanus indicus*) 5, potato and brinjal (*Solanum melongena*) 8.2, *Amaranthus gangeticus* 2.1, groundnut oil 5.0, milk powder 0.9 and salt 0.3 per cent., or the same with 25 per cent. of the cereal replaced by tapioca flour, sweet potato flour, a 4:1 mixture of sweet potato flour and groundnut cake flour, or a 4:1 mixture of tapioca flour and groundnut cake flour.

Average weekly weight gains were significantly improved by all 4 substitutes for 25 per cent. of rice, by all except sweet potato flour for 25 per cent. of wheat, and by the groundnut cake mixtures for 25 per cent. of ragi. The rice-tapioca result was confirmed with different samples of rice and tapioca. In paired feeding tests the difference between rice and tapioca and rice alone was not significant. Further experiments suggested that the beneficial effect of tapioca was due to the extra Ca it supplied, and balance experiments showed that on the average rats on the rice-tapioca diet retained significantly more Ca than those on the rice diet, the differences being 6 mg. and 4 mg. weekly for feeding to appetite and paired feeding, respectively. When the diets were given to appetite there was little difference in N retention, but with paired feeding N retention was less on the rice-tapioca diet than on the rice diet. Even a 50:50 mixture of rice and tapioca gave significantly better weight gains than rice alone, provided the diets were given to appetite.—W. M. Deans.

3521

HARRIS, L. E., HARRIS, J. R., MANGELSON, F. L., GREENWOOD, D. A., BIDDULPH, C., BINNS, W. and MINER, M. L. **Effect of feeding DDT-treated alfalfa hay to swine and of feeding the swine tissues to rats.** *J. Nutrition*, 1953, **51**, 491-505. [Utah Agric. Exp. Stat., Utah State Agric. Coll., Logan.]

Four plots of alfalfa hay were dusted with 20 lb. per acre of 10 per cent. DDT dust 14 days before the crop was cut for hay, which was sun-cured and baled. Corresponding plots, untreated, were harvested in the same way. Weanling pigs were given a ration of ground barley, soya bean meal, dried whey, fish meal, tankage, salt and shark liver oil concentrate. For different groups up to 33 per cent. of treated or untreated hay replaced a corresponding amount of barley. The treated hay contained 23 p.p.m. DDT on a dry matter basis. At the highest hay intake the DDT had no effect on the rate of growth, feed utilisation or health of the pigs up to the time of slaughter at 210 lb. liveweight.

Samples of raw fat, cured bacon and cured shoulder from the control and experimental pigs were given to weanling rats on an otherwise normal ration for 14 weeks, the DDT in the diets averaging on a dry matter basis 2.2, 2.3 and 5.3 p.p.m. when the fat, bacon and shoulder came from pigs fed on treated hay. DDT in the diet did not influence gain in bodyweight or food consumption. All the animals and tissues were normal at post-mortem examination.—W. Godden.

3522

ELLIOTT, H. C. (Jr.) and PIGMAN, W. **The effect of a typical infant's diet on the caries incidence of the Syrian hamster.** *J. Dent. Res.*, 1954, **33**, 27-32. [Dept. Biochem., Dent. Sch., Univ. Alabama, Birmingham.]

Hamsters weaned at 17 days old were given for 58 days a laboratory chow diet with 28.2 per cent., or other synthetic diets with 78.2, 70.5, 74.0 or 61.8 per cent., water-soluble carbohydrates. Of these the last was a common infant feeding mixture, 38 per cent. Dextri-Maltose and 62 per cent. powdered whole milk.

The findings of earlier workers were confirmed regarding the caries-producing effects of diets rich in water-soluble carbohydrates, but next to the chow diet the infant food had the smallest effect. It is suggested that all carbohydrates are not equal in their caries-producing power.—D. Harvey.

3523

PEREZ-TAMAYO, R., MURPHY, W. R. and IHEN, M. **Effect of cortisone and partial starvation on liver regeneration.** *Arch. Pathol.*, 1953,

N.A. and R., July 1954

56, 629-636. [Dept. Pathol., Sch. Med., Washington Univ., St. Louis, Mo.]

Rats received a stock diet to appetite or in restricted amounts to bring about loss of weight. Those of 3 groups of 20 were subjected to partial hepatectomy, the other 3 groups to control laparotomy.

Cortisone inhibited liver regeneration; the number of cells regenerated was less but their size was greater. In animals losing weight on restricted food intake, cortisone tended to maintain liver weight. Restricted food intake failed to inhibit liver regeneration.—D. Duncan.

3524

BELDEROK, B. Oestrogene stoffen in grassen en klavers. [Oestrogens in grasses and clovers.] *Voeding*, 1954, **15**, 120-126. [Lab. Physiol. Dieren, Landbouwhogsch., Wageningen.] English summary.

A review.

3525

CARTER, M. W., SMART, W. W. G. (Jr.) and MATRONE, G. Estimation of estrogenic activity of genistein obtained from soybean meal. *Proc. Soc. Exp. Biol. Med.*, 1953, **84**, 506-507. [Animal Nutrit. Sect., Dept. Animal Indust., N. Carolina Agric. Exp. Stat., Raleigh.]

Genistein isolated from solvent-extracted soya bean meal was found with immature mice to be 4.44×10^{-6} times as potent as diethylstilboestrol in oestrogenic activity. The meal itself was also active.—D. Harvey.

3526

SHILS, M. E. and GOLDWATER, L. J. Effect of diet on the susceptibility of the rat to poisoning by 2, 4-dinitrotoluene. *Arch. Indust. Hyg.*, 1953, **8**, 262-267. [Dept. Occupational Med., Sch. Pub. Health, Columbia Univ.]

Four diets containing casein, maize oil, glucose, minerals and vitamins, constructed to provide a low protein and high fat intake, or low protein and low fat, or moderate protein and high fat, or moderate protein and low fat, were given to comparable groups of albino rats with or without addition of 2:4-dinitrotoluene. Difficulty was experienced in obtaining equal intakes of dinitrotoluene when it was incorporated in the diet, so further tests were made with the substance administered parenterally. With low-protein diets a high intake of fat appeared to protect the animals against the toxic substance. With moderate protein intake the lethal effect of dinitrotoluene was always prevented. The drug decreased growth on all the diets, but less with diets containing moderate amounts of protein.—A. M. Copping.

GENERAL METABOLISM AND FEEDING HABITS OF ANIMALS OTHER THAN MAMMALS AND BIRDS

3527

FONTAINE, M. and CALLAMAND, O. Le foie gras chez les poecilothermes. [Fatty liver in poikilotherms.] *Ann. Nutrit. Alimentation*, 1953, **7**, C283-C313 (with discussion C313-C314). [Muséum d'Histoire Naturelle, Paris.]

3528

COHEN, E. A comparison of the total protein and albumin content of the blood sera of some reptiles. *Science*, 1954, **119**, 98-99. [Dept. Zool., Rutgers Univ., New Brunswick, N.J.]

Total protein and albumin were estimated by the biuret method of Gornall *et al.* (Abst. 1695, Vol. 19) in the blood sera of 13 species of snake and 6 of turtle.

The results are presented in detail. There was no significant difference in total protein between snakes and turtles; albumin content differed significantly.—P. C. Jowsey.

3529

CHURÝ, Z. Některé haematologické údaje u hladovějící ropuchy zelené (*Bufo viridis*).

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[Some haematological data in the fasting green toad (*Bufo viridis*).] *Scripta med.*, 1952, **25**, 23-30. [Inst. Gen. Exp. Pathol., Masaryk Univ., Brno.] English and Russian summaries.

The blood picture was studied in *Bufo viridis* fasted for 2 to 6 weeks at the beginning of summer. The average counts were erythrocytes 479,000, leucocytes 7000 and platelets 9000 per c. mm.; the average size of erythrocytes was $16.7 \times 13.0 \mu$. Erythroblasts were found in the peripheral blood, and polychromatophilia with relative and absolute lymphocytosis combined with neutropenia and monopenia occurred during fasting. Lymphocytosis and the occurrence of erythroblasts might be explained by reduced activity of endocrine glands and the vegetative nervous system.

M. Prokšová (Czechoslovakia).

3530

NEBOLSINA, T. K. Pitanie mal'kov i leshcha v severnom Kaspii. [The nutrition of juvenile roach and bream in the northern Caspian.] *Dokl. Akad. Nauk S.S.S.R.*, 1953, **91**, 1225-1228. [Kasp. Bassein. Filial., Vses. Nauch.

Issled. Inst. Morsk. Ryb. Khoz. i. Okeanografiya.]

The intestines of 905 young roach and 542 bream from the northern Caspian were examined in 1949. Young roach feed on organisms living on the sea bed, mainly molluscs and crustaceans; the food of the young bream is crustaceans, zooplankton (Cladocera and Copepoda) and worms. The differences in the food of young roach and bream of different lengths were trifling.

W. Hughes.

3531

JANČÁŘEK, A. Příspěvek k fyziologii kapří digesce: Trávení bílkovin. [The physiology of digestion in the carp: digestion of proteins.] *Sborn. Vysoké Šk. Zeměd.*, 1949, **41D**, 1-60. [Sch. Agric., Univ. Brno.] English and Russian summaries.

The proteolytic activity of intestinal liquor, bile, extracts of liver and pancreas and intestinal tissue were studied by a modification of the methods of Gautier, Roche and Baratte. Extracts were also examined of the bodies of some animals forming the natural food of the carp: Tubificidae, Daphnidae, Lumbricidae, Ostracoda and mosquito larvae (*Culex*).

The intestinal liquor had the highest absolute protease activity. At temperatures between 10° and 50° C. the bile, liver and pancreas showed similar curves of activity. The curves of activity of diluted intestinal liquor and intestinal tissue at different temperatures were strikingly continuous and similar, probably because of integration of the activity of a series of enzymes. The extracts of liver and pancreas were activated by those of the intestinal mucosa or contents, the latter being more effective. It is considered that the greater effect of the contents was due to the enzymic components of the animal food, i.e., to exogenous enzymes. The bile of the carp also contained proteases in an inactive form, which were activated by diluted intestinal liquor.

In extracts of animals which serve as food for the carp the greatest absolute proteolytic activity was shown by the extract of rainworms, *Eisenia* sp. *Tubifex* and *Daphnia* had considerably less absolute activity. Extracts of carp liver and pancreas were activated by the extract of *Tubifex* or *Daphnia*, carp bile by the extract of a mixture of Ostracoda and mosquito larvae (*Culex* sp.). It is suggested that in the intestinal mucosa of the carp and in the bodies of phylogenetically lower animals, e.g. (rainworm, *Tubifex*, Ostracoda and mosquito larvae) there is an enzyme activator, together with inhibitors which are probably products of enzyme activity. Only when the inhibitors become diluted is this enzyme effective in activating the proteases. (From author's summary.)—M. Prokšová (Czechoslovakia).

3532

SUNDARAM, T. K., RADHAKRISHNAMURTY, R., SHANMUGASUNDARAM, E. R. B. and SARMA, P. S. Tryptophan metabolism in rice moth larva (*Corcyra cephalonica* St.) *Proc. Soc. Exp. Biol. Med.*, 1953, **84**, 544-546. [Univ. Biochem. Lab., Guindy, Madras.]

See Abst. 2238, Vol. 24.

Paper chromatography was used to investigate the tryptophan metabolites in faeces extracts from larvae. The yellow pigment excreted by pyridoxine-deficient larvae receiving tryptophan consisted of kynurenine and 3-hydroxykynurenine. Both were absent when the larvae received pyridoxine. Several unidentified substances were present in extracts from faeces of both groups. The absence of xanthurenic acid was confirmed.

D. Duncan.

3533

SISAKYAN, N. M. and KUVAEVA, E. B. Obmen veshestv polostnoi zhidkosti tutovogo shelkopryada v prochesse metamorfoza. [Metabolism in the body fluid of the silkworm during metamorphosis.] *Biokhimiya*, 1953, **18**, 354-362. [Inst. Biokhim. A. N. Bakha, Akad. Nauk SSSR, Moscow.]

3534

KURSA NOV, A. L. and VISKREBENTZEVA, E. I. Gazoobmen polostnoi zhidkosti tutovogo shelkopryada v period razivtnya kukolki. [Gaseous metabolism in the body fluid of the silkworm at the time of development of the pupa.] *Biokhimiya*, 1953, **18**, 363-370. [Inst. Biokhim. A. N. Bakha, Akad. Nauk SSSR, Moscow.]

3535

MAGIS, N. Mise en evidence de préférences alimentaires chez "*Tribolium castaneum*" Herbst (Coléoptère, Tenebrionidae). [Demonstration of food preferences in *Tribolium castaneum* Herbst (Coleoptera, Tenebrionidae).] *Arch. internat. Physiol.*, 1954, **62**, 22-32. [Lab. Biochim., Inst. Léon Frédéricq, Univ. Liège.]

3536

GHIRETTI, F. Enteramina, octopamina e tiramina nelle secrezioni esterna ed interna delle ghiandole salivari posteriori dei Cefalopodi Octopodi. [Enteramine, octopamine and tyramine in the external and internal secretions of the posterior salivary gland of octopod cephalopods.] *Arch. Sci. biol., Bologna*, 1953, **37**, 435-441. [Ist. Fisiol. Gen., Univ. Naples.]

Chromatographic analysis showed that when the posterior salivary glands of *Octopus vulgaris* were

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electrically stimulated, tyramine, octopamine and enteramine passed into the perfusing liquid. Under the same conditions the glands of *Octopus macropus* secreted only tyramine and octopamine, so the high biological activity of perfusates of the glands of *O. vulgaris* is attributed to the enteramine.

Chromatograms of acetone extracts of the saliva of *O. vulgaris* revealed the presence of tyramine, octopamine, enteramine A and enteramine I. The enteramine I is probably a metabolic transformation product of enteramine A.

M. B. Richards.

See also Abst. 3289.

5. HUMAN DIET IN RELATION TO HEALTH AND DISEASE

DIET AND HEALTH

REQUIREMENTS

3537

ALLEN, T., MACLEOD, A. V. and YOUNG, E. G.
On the nutritional requirements of young children with particular reference to calcification. *Canad. J. Med. Sci.*, 1953, **31**, 447-461.
[Dept. Biochem., Dalhousie Univ., Halifax, N.S.]

Results are reported of a nutritional survey of 158 children aged from 1 to 6 years. One-week diet records were obtained by the weighing method, and bodyweight, height, chest circumference and pelvic girth were measured; Hb was estimated and counts of red and white cells were made in blood of 55 children; X-ray photographs were made of the bones of the wrist of 56 of the children. Repeat studies were made 6 months later.

As judged by current Canadian diet standards deficiencies of energy, Ca and vitamin D occurred most commonly. The standard of 1.0 g. daily for Ca was not reached by 78 per cent. of the children. Detailed analysis of the repeat data relating to 36 children showed that in half there was adequate calcification and growth on substandard diets and in 30 per cent. there was inadequate calcification and growth on substandard diets. It appeared that normal maturation of bone could take place on vitamin D intakes of 25 to 150 I.U. and of Ca of less than 1 g. daily.

Average Hb for all ages combined was 12.4 g. per 100 ml.—F. C. Aitken.

3538

NATIONAL RESEARCH COUNCIL, U.S.A., FOOD AND NUTRITION BOARD. **Recommended dietary allowances.** Publ. No. 302. Revised 1953, pp. 36.

The principal changes are the grouping of adults in 3 age, instead of 3 activity groups and in the method of expressing allowances of calories. The reference man and woman of the FAO Committee on Calorie Requirements and, in principle, the FAO adjustments for age, weight and environmental temperature are accepted. Some modifications and extensions of the scheme have been introduced. Calorie allowances are reduced by 5

instead of 7.5 per cent. per decade from 25 years of age, an increase of 0.5 per cent. per year from age 20 to 24 is allowed, account is to be taken in adults of "desirable" bodyweight, and for "extremely sedentary" subjects and invalids an allowance of 1.2 times basal metabolism is considered sufficient. The pregnancy allowance is 400 Cal. in the third trimester instead of 450 suggested by FAO and the lactation allowance is 1000 Cal. for 850 ml. milk (as suggested by FAO) or 130 [? 117] per 100 ml.

Children's allowances are modified only in respect of girls 10 to 12 years of age who are to have 2300 instead of 2500 Cal. because boys of this age are more active, and girls of 13 to 15 years who have 2500 instead of 2600.

Protein allowances for children are unchanged; those for adults are related to the new reference bodyweights.

Riboflavin allowances are derived by multiplication of the protein allowances by 2.5×10^{-5} . Allowances of Ca for adults are reduced to the pre-1948 level of 0.8 g. and for girls of 16 to 20 years increased to 1.3 g. Allowances are unchanged for Fe, ascorbic acid and vitamin D, and for vitamin A except for youths of 16 to 20 years who are to have 5000 instead of 6000 I.U. There are minor adjustments to relate vitamin B₁ to calories on a uniform basis and nicotinic acid allowances are ten times those of vitamin B₁.

Other nutrients are discussed in the text as before with the addition of vitamin B₆, vitamin B₁₂, pantothenic acid and biotin.—F. C. Aitken.

3539

SHANK, R. E. **Revisions of the recommended dietary allowances.** *J. Amer. Dietetic Assoc.*, 1954, **30**, 105-110. [Dept. Prevent. Med., Washington Univ., St. Louis.]

See above Abst.

3540

PECHAR, J. **O diferencovaných normách ve výživě. [Differentiated rations in nutrition.]** *Výživa lidu*, 1954, **9**, 20-21. [Res. Inst. Nat. Nutrit., Prague.]

Normal daily allowances of protein, fat and carbohydrate, Ca and Fe, vitamins A, B₁ and C and riboflavin and nicotinic acid are given for light, medium, hard and very hard work. The respective energy allowances for these types of work are 2000, 3000, 3500 and 4500 Cal.

M. Prokšová (Czechoslovakia).

3541

SEBRELL, W. H. (Jr.) **Trends and needs in nutrition.** *J. Amer. Med. Assoc.*, 1953, **152**, 42-44. [U.S. Pub. Health Serv.]
A lecture report.

3542

WALKER, V. W. **Man, his nutrition, and his years.** *J. Clin. Nutrit.*, 1953, **1**, 552-557. [1705 Seminole Rd., Jacksonville 5, Fla.]

FEEDING OF INFANTS AND CHILDREN

3543

BARNES, G. R. (Jr.), LETHIN, A. N. (Jr.), JACKSON, E. B. and SHEA, N. **Management of breast feeding.** *J. Amer. Med. Assoc.*, 1953, **151**, 192-199. [Dept. Paediat., Sch. Med., Yale Univ., New Haven, Conn.]

The procedures used in the establishment of breast feeding and the management of problems in lactation are described.—F. C. Aitken.

3544

SÖDERLING, B. **Pseudoprematurity.** *Acta paediat.*, 1953, **42**, 520-525. [Dept. Paediat., Central Hosp., Borås, Sweden.] French, German and Spanish summaries.

It is indicated that the custom of defining prematurity in term of birthweight leads to neglect of the facts that premature infants of similar birthweight may differ in physiological maturity, and that they may therefore require different systems of management. Appetite is considered to vary with maturity and to be a better guide to feeding requirements than are quantities based on bodyweight. Rigid regimes of this kind may lead to overfeeding which may prove lethal, or to underfeeding and consequent low metabolism and low body temperature. Charts are given for the weight trends and energy intakes of 4 infants fed to appetite, and a plea is made for study of the phenomena of foetal maturity.—A. M. Thomson.

3545

BÜSCHER, L. and GLEISS, J. **Vergleichende Untersuchungen über die Ernährung der Frühgeburt mit Frauenmilch, Milchezucker-Eiweissmilch, Milchezucker-Fettmilch und Säure-2/3-Milch.** [Comparative investigation of human milk, lactose-and-protein milk, lactose-and-fat milk, and acid two-thirds milk for premature

infants.] *Monatsschr. Kinderheilk.*, 1953, **101**, 357-360. [Kinderklin., Med. Akad., Düsseldorf.]

Groups of 18 or 20 premature infants were given one of 4 types of milk from the second month of life, for from 4 to 6 weeks. The weight increase with lactose-and-fat milk and lactose-and-protein milk was intermediate between the highest increase with human milk and the lowest with acid two-thirds milk. With human milk metabolic disturbances and complications were much less frequent.—E. M. Hume.

3546

DELTHIL, P. **Essais d'alimentation complémentaire chez les prématurés.** [Trials of supplementary feeding of premature infants.] *Pédiatrie*, 1953, **8**, 917-924. [Centre Prématurés, Hôp. Saint-Denis, Paris.]

The special nutritional requirements of premature infants are discussed with particular reference to protein needs for rapid growth and vitamin and mineral supplements. A satisfactory supplementary feeding mixture was made up from aminoacids supplied by a yeast hydrolysate, with vitamin B₁, riboflavin, nicotinic acid, pantothenate, vitamin B₁₂, vitamin C, vitamin D, dicalcium phosphate, magnesium phosphate, manganese chloride and ferrous carbonate mixed with full cream dried milk. When suitable amounts of the mixture were given in addition to breast milk improved weight gains resulted. In the 42 premature infants which were given the mixture no sign of intolerance or digestive disturbance was recorded.

A. M. Copping.

3547

COODIN, F. J. **Studies of terramycin in premature infants.** *Pediatrics*, 1953, **12**, 652-656. [Margaret Hague Maternity Hosp., Jersey City, N.J.] Spanish summary.

Daily administration of 25 mg. terramycin to 57 premature infants did not influence rate of weight gain. There were 56 controls. Changes in bacterial flora of throat and stools are discussed.

F. C. Aitken.

3548

EWERBECK, H. **Die adaptierte künstliche Säuglingsnahrung, ein Eiweissproblem.** [Artificial humanised food for infants, a protein problem.] *Öst. Ztschr. Kinderheilk.*, 1953, **9**, 121-129. [Kinderklin., Univ. Cologne.]

Two commercial humanised milk preparations were studied. Though both approximated in their gross chemistry to human milk, electrophoretic analysis showed that the composition of their protein component approximated to that of cow's milk. Compared with breast milk the casein content was high and the whey protein was poor in β -lactoglobulin.—L. Wills.

3549

- HATFIELD, M. A., SIMPSON, R. A. and JACKSON, R. L. **A study of the comparative response of young infants to human milk and to various types of cow's milk formulas.** *J. Pediat.*, 1954, 44, 32-45. [Dept. Paediat., Coll. Med., State Univ. Iowa.]

Evaporated milk preparations gave a higher incidence of irritation of the buttocks in newborn infants than did one with diluted cow's milk or breast feeding. There was no significant difference in stool pattern with difference in the method of artificial feeding. In this study there were 180 infants from birth to 6 days of age. In a study with 33 infants aged from 1 to 8 weeks, heat-sterilised evaporated milk preparations produced softer stools than did fresh milk or frozen evaporated milk preparations. Test periods in this study were each of one week's duration.

F. C. Aitken.

3550

- WICKES, I. G. **A history of infant feeding. 5. Nineteenth century concluded and twentieth century.** *Arch. Dis. Childhood*, 1953, 28, 495-502.

See also Titles 4939, Vol. 23 ; 993, 2258, Vol. 24.

3551

- GRAHAM, S. **The diet of the toddler.** *Practitioner*, 1954, 172, 244-249. [Dept. Child Health, Univ. Glasgow.]

3552

- REDDY, S. K., DORAISWAMY, T. R., SANKARAN, A. N., SWAMINATHAN, M. and SUBRAHMANYAN, V. **Effects on the general health and nutritional status of children of partial replacement of rice in a poor vegetarian diet by tapioca flour.** *Brit. J. Nutrition*, 1954, 8, 17-21. [Central Food Technol. Res. Inst., Mysore.]

Since previous experiments (Absts. 3293, 3520, Vol. 24) had indicated that 25 per cent. of the rice in a poor rice diet could be replaced by tapioca without ill effects on rats or adult men, a 6-month feeding experiment was made in an orphanage with 2 groups of about 30 healthy girls aged from 5 to 12 years. One group had the orphanage diet, of the usual South Indian type, mainly rice with small quantities of pulses and vegetables, and the other had 25 per cent. of the rice replaced by tapioca flour. A one-week dietary survey and calculation of the nutrient intakes showed that the rice-tapioca diet supplied slightly less protein and slightly more Fe than the rice diet; supplies of other nutrients were about the same, but nearly all were far below the Indian recommended allowances.

No difference was found between the groups in increments of height, weight or hip width, nutri-

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tional status as judged by the recommendations of the Indian Council of Medical Research Nutrition Advisory Committee (1948), red cell count, or serum protein. Hb fell in both groups; the decrease was significantly less in the rice-tapioca group. It was concluded that the children's health had not suffered from the substitution of tapioca for 25 per cent. of the rice in their diet.

W. M. Deans.

3553

- BIANQUIS, CUVIER, LESNÉ and ROHMER. **Les modalités les plus convenables pour la distribution de lait à des enfants d'âge scolaire. [The best ways of distributing milk to children of school age.]** *Pédiatrie*, 1953, 8, 953-956.

The need of schoolchildren for extra milk is stressed. It was found unsatisfactory to give milk in the morning as it affected the appetite for the midday meal. At 4.0 or 4.30 p.m., however, milk was acceptable. It is suggested that it should be boiled and given warm and sweetened to increase its acceptability and energy value. Country children who may live far from the school have a special need for a milk supplement to their diets. Rickets and malnutrition are more common in rural children, and a further report is to be made on Ca requirements.

A. M. Copping.

See also Absts. 3151, 3193, 3426, 3800.

DIETARY SURVEYS AND INDIVIDUAL STUDIES

3554

- EIJKEL, R. N. M. **Wijze, waarop het onderzoek naar de voeding in gezinnen en gestichten kan worden uitgevoerd. [Diet survey methods for households and institutions.]** *Voeding*, 1954, 15, 56-67.

Families chosen for diet surveys should be representative of an area, both regionally and by occupation. For the whole country, about 1000 families should suffice; for a community or area with about 100,000 inhabitants, 80; for 20,000 to 100,000 inhabitants, 30 and for less than 20,000 inhabitants, 16 families. The statistician who will analyse the results should be consulted in advance. The choice of families should not select one class or type, but should be representative. Social organisations should help to procure volunteers.

The survey should be made by trained workers. The design of books for records is briefly discussed. The duration may be a week or a month at a time, and to give information for a year, there should be 3 surveys. The task is simpler in institutions than in private families.

The discussion of methods of analysis deals chiefly with man values or consumption units. There is a brief section on diet histories.

I. Leitch.

3555

YOUNG, C. M., CHALMERS, F. W., CHURCH, H. N., CLAYTON, M. M., MURPHY, G. C. and TUCKER, R. E. **Subjects' estimation of food intake and calculated nutritive value of the diet.** *J. Amer. Dietetic Assoc.*, 1953, **29**, 1216-1220. [Agric. Exp. Stat., Cornell Univ.]

Six groups of subjects, 25 and 16 children, 17 pregnant women, 56 male industrial workers, 14 and 21 college students, were asked to estimate the quantities of food which they ate at one or three meals. The quantities were measured and nutrient intakes were computed from estimated and measured food intakes.

For all the groups except one of the groups of children subjects' errors in estimating quantities of food had little influence on the accuracy of mean calculated intakes of nutrients. On an individual basis there were wide differences between nutrient intakes computed from estimated and measured food intakes.—F. C. Aitken.

3556

MINISTRY OF FOOD. **Domestic food consumption and expenditure, 1951. Annual report of the National Food Survey Committee.** H.M.S.O., London, 1953, pp. 116. Price 3s. 6d. net.

This report presents the data for 1951 and compares them with those for 1950 (see Abst. 764, Vol. 23).

Changes in the methods of collecting the data, which came into operation in June 1951 and are fully described in an appendix, were aimed at overcoming defects found in the system which was in use in 1950, and they resulted in a general simplification. For the 4 quarters of the year the mean amounts spent per head per week on food were 182.0, 193.7, 224.0 and 225.5 pence. The higher nutritive values for the latter half of the year reflected these changes. Value of consumption in 1951 was greater than in 1950 by 18 per cent., an increase similar to that of 16 per cent. which occurred in prices. In terms of food decreases in eggs, meat and to a less extent in fats and increases in fish, vegetables other than potatoes, fruit, sugar and preserves gave rise to small changes in 1951 compared with 1950 but, by the British Medical Association's standards, the levels of intake of energy and of 8 nutrients remained adequate.

In relating food consumption and expenditure to income and social status the system of classification was unchanged from the previous report. Class A included about 7 per cent. of both households and persons, Classes B and C, together, about 70 per cent. of households and 76 per cent. of persons; the remainder, Class D, were subdivided into old-age-pensioner households and others. Comparison was made with the previous

year by expressing value of consumption for each class as a percentage of the national average. At the end of 1950 differences between classes had widened, but by the end of 1951 these differences had narrowed. In nutritional value it appeared that energy value and Ca had declined slightly in Classes A and B; in Class D they had risen. Protein intake by Class D had also improved. In all classes intakes of Fe, vitamins A and B₁, riboflavin and nicotinic acid had increased.

When requirements were considered class differences were found to be small. Fe consumption, about which doubt regarding the standard may exist, was below the recommended amount in the old-age-pensioner households but except for some small shortages of energy the intakes for all classes were above the British Medical Association recommendations. When, however, the composition of the households was taken into consideration there was evidence that in the larger families, i.e., with 1 male and 1 female adult and 4 or more children, intakes of total protein and of Ca were low.

In the last half of the year expenditure on subsidised foods was a little over 9s. per head per week, nearly 50 per cent. of the total expenditure on food; the cash value of the subsidy was about 2s. 9d. per head per week or 30 per cent. of the expenditure on subsidised food.

The contributions of different foods to the nutrient content of the diet was examined; except for vitamins A, C and D, on which seasonal changes had their effects, there was great constancy of the proportions from particular foods.—D. Harvey.

3557

CHOMBART DE LAUWE, P., CHOMBART DE LAUWE, M. and BENOIT, O. *Étude sur certaines motivations du comportement alimentaire. 1. Ménages ouvriers (légumes, crudités, conserves).* [Some reasons for behaviour towards food. 1. Working-class households (vegetables, salads, tinned foods).] *Bull. Inst. nat. Hyg., Paris*, 1954, **9**, 119-132 (to be continued). [Centre d'Études Sociologiques, C.N.R.S., Paris.]

Food attitudes were investigated in 133 working-class households in Paris and its suburbs. Attitudes towards meat have already been reported (Title 772, Vol. 23). Potatoes and alimentary pastes are valued because they are "filling"; green vegetables, both cooked and raw, for their "refreshing" qualities, except by some who find they disturb digestion. Tomatoes, radishes and other non-green salad vegetables are regarded more as a luxury than a necessity. Fruits are valued, especially for children; men do not eat them much. Nearly half the people displayed ignorance of or contempt for vitamins. Tinned foods are

not much used except as an occasional convenience or luxury; apart from their cost, many dislike or distrust them. The same distrust of "artificial" foods was forcibly expressed by a variety of abusive remarks on margarine. Those who use it do so mainly for cooking and because of its cheapness.—W. M. Deans.

3558

DARBY, W. J., DENSEN, P. M., CANNON, R. O., BRIDGFORTH, E., MARTIN, M. P., KASER, M. M., PETERSON, C., CHRISTIE, A., FRYE, W. W., JUSTUS, K., MCCLELLAN, G. S., WILLIAMS, C., OGLE, P. J., HAHN, P. F., SHEPPARD, C. W., CAROTHERS, E. L. and NEWBILL, J. A. **The Vanderbilt cooperative study of maternal and infant nutrition. 1. Background. 2. Methods. 3. Description of the sample and data.**

DARBY, W. J., MCGANITY, W. J., MARTIN, M. P., BRIDGFORTH, E., DENSEN, P. M., KASER, M. M., OGLE, P. J., NEWBILL, J. A., STOCKELL, A., FERGUSON, M. E., TOUSTER, O., MCCLELLAN, G. S., WILLIAMS, C. and CANNON, R. O. **4. Dietary, laboratory and physical findings in 2,129 delivered pregnancies.** *J. Nutrition*, 1953, **51**, 539–563; 565–597. [Div. Nutrit., Dept. Biochem., Sch. Med., Vanderbilt Univ., Nashville, Tenn.]

1. This study concerned all pregnant white women who presented themselves for antenatal care at the Vanderbilt Hospital. Background data are presented from recalculations based on the work of Youmans *et al.* (Absts. 507 and 3360, Vol. 13) and Darby and Milam (Abst. 3575, Vol. 15) and from unpublished studies by Robinson, Steinkamp and Kaser.

2. At the time of the first visit each patient underwent a special nutritional and physical examination and blood was sampled for red cell count and packed cell volume measurement and estimations of serum ascorbic acid, carotene and vitamin A, total serum proteins and serum albumin. A week or so later tolerance tests with vitamin B₁, riboflavin and N¹-methylnicotinamide were made, after which the patients kept a 7-day record of food consumption from which average daily intakes of nutrients were calculated. Once during each subsequent trimester the diet studies, physical examinations and laboratory tests were repeated; 6 weeks *post partum* there were repetitions of the physical examinations and laboratory tests. The haematology and plasma protein levels of the infant were studied at 6 days of age and later generally in the second month.

3. From 1945 to 1949 pregnancies numbering 2338 and including two or more from 260 women were studied. The women belonged to "low to moderate" income groups. Information was com-

plete for only 2046 pregnancies but there was no reason to believe that the exclusion of 292 affected the representative nature of the population studied.

4. Mean energy and nutrient intakes are tabulated for each trimester. For energy the amounts were 2140, 2200 and 2020 Cal., 14 per cent. of which were derived from protein. Approximately 65 per cent. of the protein was of animal origin. Average Ca intake was about 1.4 g. daily. Although intakes of nutrients tended to be below accepted standards, the shortages did not cause concern. Woman who entered the study in a trimester later than the first recorded intakes of nutrients higher than those of women at the same stage of pregnancy who entered at an earlier trimester. It was not possible to decide whether these differences were due to appetite or whether they were the result of advice on weight restriction given by the physicians. Data are given for seasonal variations in energy intake and for the amounts of certain foods consumed in the third trimester. Other tables and diagrams summarise the laboratory findings. Women attending for the first time in the second and third trimesters had values generally higher than those attending earlier; the depressed haematological values may have produced an "ill-defined sense of less-than-buoyant health" in those who attended earlier. No clinically recognisable deficiency disease was seen, and in respect of subclinical signs there were variations from one examiner to another. The mean height of the patients was 64.0 in. and the mean weights were 122, 127, 139 and 126 lb. in the three trimesters and *post partum*, respectively.

A. M. Thomson.

3559

MURPHY, G. H. and WERTZ, A. W. **Diets of pregnant women: influence of socio-economic factors.** *J. Amer. Dietetic Assoc.*, 1954, **30**, 34–38. [Univ. Massachusetts, Amherst.]

Sixty-five women, private patient volunteers, kept records of food consumed for 7 days during early and late pregnancy and 3 months *post partum*. Quantities were recorded in terms of household measures. Average nutrient intakes are given and are compared with the recommended allowances of the U.S. National Research Council. Diets were classified into 3 groups according to the extent by which they fell short of the standards, and results were assessed in relation to the size of the family, weekly food cost per food expenditure unit, income, and social (occupational) class. Money spent on food was not related to income, or to adequacy of diet. As social levels rose, diets tended to improve.—A. M. Thomson.

3560

GOVIL, K. K., MITRA, D. and PANT, K. C. **Dietary habits of school boys in Uttar Pradesh.** *Indian*

Med. Gaz., 1953, **88**, 357-363. [Nutrit. Lab., Provincial Hyg. Inst., U.P., Lucknow.]

Foods consumed in 14 hostels were weighed for 1 week and mean daily intakes of nutrients per head were computed for each hostel. Compared with recommended allowances for Indian children diets were low in animal protein, Ca, vitamin A and ascorbic acid. Riboflavin intakes were borderline.

The results of this diet survey of 412 boys were in line with the findings in clinical studies of these and other children summarised here from a previous publication (Abst. 1049, Vol. 24).—F. C. Aitken.

3561

KARK, E. **The growth and nutritional state of Bantu girls in Durban.** *S. African J. Med. Sci.*, 1953, **18**, 109-124. [Inst. Family and Community Health, Durban.]

Girls numbering 365 and attending 2 schools in an African housing area in Durban were examined and, for 11 months, 300 were the subjects in a feeding experiment. Weight, height, sitting height, width, depth and circumference of chest and pelvic width were recorded.

Data are tabulated for mean weight and height for the age groups 8 to 15 years at yearly intervals and are compared with other South African findings for African and European children. The main abnormalities found by clinical examination are presented: dental caries in 56.2 per cent. and postural defects in 28.8 per cent. of the girls were by far the commonest disorders. Mean Hb for 211 girls was 11.78 g. per 100 ml. blood.

The extra food, given at school on 182 days, was $\frac{1}{2}$ pint milk or 8 oz. fruit syrup supplying the same energy, 200 Cal. The findings are discussed in respect of increases in weight and height, changes in appearance of skin and oral mucous membranes and absenteeism from school. Differences in growth of the girls between the groups were not significant. The skin was studied by noting occurrence in 9 areas of abnormalities of lustre, texture, pilosebaceous follicles and infections and other defects. Mucous membranes were also referred to regionally as lips, gums, buccal mucosa and tongue. In both groups there was improvement as measured by the increases in percentages of subjects found to have one or more skin regions normal and by the total number of normal skin regions within the groups. None had all 9 areas free from abnormality; the best had 4 areas which were normal. In respect of mucous membranes both groups were improved after extra feeding; the improvement in gums and tongue seemed to be greater in the milk than in the syrup group. Absenteeism, of which sickness was probably the main cause, was less, 2.76 per cent., in the milk than in the syrup group, 3.72 per cent.

It is concluded that in the girls' home diets

there may have been a shortage of energy which was made good by the extra feeding. Subsequent clinical findings after the end of the experiment are to be the subject of another report.—D. Harvey.

3562

JELLIFFE, D. B. and WILLIAMS, L. L. (with JELLIFFE, E. F. P.) **A clinical nutrition survey in a rural Jamaican village (with especial preference to the children).** *J. Trop. Med. Hyg.*, 1954, **57**, 27-40. [Univ. Coll. West Indies, Jamaica.]

In a hill village in Western Jamaica 252 persons, 87 per cent. of the population, who are of predominantly African descent, were clinically examined with special attention to hair, skin, mouth and eye changes which may point to malnutrition; the classification of these is described in detail. A qualitative account of the diet is given; it contains a wide variety of foods but very little animal protein. Children after weaning at about 12 months get only small amounts of sweetened condensed milk and few eggs, their main food being porridge of degermed yellow maize meal or other cereals.

Breast-fed infants appeared well nourished but children between 1 and 3 years were thin and anaemic, with palpable livers and dyspigmentation of the hair. Since malaria was absent and intestinal infestation uncommon, their state was ascribed to protein deficiency; but no case of manifest kwashiorkor was seen during the survey. Older children were thin but wiry and alert; hair changes were found in over a fifth of them, and mosaic skin, permanent gooseflesh and dyspigmentation of the face were common. Adults were on the whole of better physique; skin changes were much less common than among the children, and hair changes were not present. Slight angular stomatitis was not uncommon; cheilosis was rare, and no pellagrous rash, crazy pavement dermatosis or follicular keratosis was seen. Gingivitis and caries were prevalent among both children and adults. The former was ascribed to poor dental hygiene, not to lack of vitamin C, and the latter to the low Ca intake and the use of finely milled flour and sugar. The incidence of excess tissue of the bulbar conjunctiva and pterygia increased with age, but these were ascribed to exposure to sunlight, not to dietary deficiency.—W. M. Deans.

3563

VELEZ, F. and BRAUNSTEIN, A. B. **Encuesta de hábitos alimenticios en un grupo de escolares. [Study of food habits of a group of scholars.]** *Arch. venezol. Nutrición*, 1952, **3**, 419-431. [Inst. Nac. Nutrición, Caracas.] English and German summaries.

A study was made of the breakfast habits of 1064 children aged from 5 to 16 years; 86 per cent. were Venezuelan by birth and 75 per cent. were of the middle class.

The most popular foods and the percentages of children eating them were: sugar 71.2, coffee with milk 62.9, butter 61.9 and wheat bread 59.8. Arepa, a kind of maize biscuit, and cheese were eaten by 41.0 and 40.0 per cent. of the children, respectively. Milk was taken by 27.5 per cent., eggs by 17.5, citrus fruits by 5.3 and fruit juice by 4.7 per cent. Four children, 0.4 per cent., had no breakfast.

One or 2 foods only were eaten by 7.3 per cent., 3 to 6 foods by 87.0 per cent. and 7 to 11 foods by 5.7 per cent. of the children.

Heights and weights were compared with the official national standards and, on this criterion alone, 86.6 per cent. of the children were considered to be adequately fed and 13.4 per cent. to be undernourished, but most of them only slightly so.—P. C. Jowsey.

3564

BENGOA, J. M., OBREGON, V. M. and GONZALEZ, M. Influencia del factor economico en el consumo de alimentos en el medio rural. [Effect of economic circumstances on food consumption in a rural area.] *Arch. venezol. Nutricion*, 1952, 3, 343-418. English and German summaries.

See Abst. 3394, Vol. 23, for a general survey of the district.

The data obtained from a week's dietary survey in Santa Teresa del Tuy of 152 families with a total of 789 persons, representing 18 per cent. of the population, are set out in 54 tables and 24 graphs. The families were divided into 5 groups according to income.

In Group 1, 44 families, the monthly income was below 200 bolivars (B.), and the average daily expenditure on food per person was B. 1.06. In this group there were grave nutritional deficiencies, calling for assistance beyond educative work. The average intakes per person were: energy 1282 Cal., protein 46.8 g., of which only 8.8 was of animal origin, Ca 0.27 g., vitamin A 626 I.U., riboflavin 0.45, nicotinic acid 2.8, vitamin B₁ 0.68, and vitamin C 18 mg. The Fe intake of 13.5 mg. was higher than the allowance recommended by the U.S. National Research Council. The basic foods of the group were cereals, unrefined sugar and black beans. Consumption of fish and meat was 28 g. per head, of milk 43 ml. and of powdered milk 7 g. Practically no eggs, butter, root vegetables, tubers, green vegetables or fruit were consumed.

In Group 2, 46 families with monthly income between 201 and 400 B., the average daily cost of

food per person was B. 1.23. This group showed an increase in quantity rather than in quality of the foods consumed and had significantly more Calories (1657) and protein (55.9 g.) per person than Group 1; there was practically no change in the amounts of Ca, Fe, vitamin B₁, riboflavin, nicotinic acid and vitamin C.

In Group 3, 29 families with monthly incomes between B. 401 and 600, the daily expenditure on food per person was B. 1.50. The food in this group was better than that of the two preceding groups. Consumption of energy, protein, Fe, vitamin B₁ and nicotinic acid was satisfactory, but that of Ca, vitamin A, riboflavin and vitamin C was only about 50 per cent. of the requirement. In this group educative work might well effect improvement in the diet.

In Group 4, 16 families having incomes from 601 to 800 B., and a daily expenditure on food of 1.81 B., the characteristics were similar to those of the third group, except for an increase in protein consumption, especially of animal protein.

In Group 5, comprising 14 families with incomes of B. 801 or more and a daily food expenditure of 2.21 B., food conditions were satisfactory, except that the intakes of Ca and vitamin A were still inadequate.

Economic conditions greatly influenced the consumption of wheat bread, meats, milk, eggs and fresh vegetables, and only to a slight extent the consumption of maize, rice, other cereals, oatmeal, lard, legumes and unrefined sugar. For all the families studied the nutritive values per person per day were: energy 1670 Cal., protein 55.9 g., Ca 0.43 g., Fe 12.6 mg., vitamin A 1082 I.U., vitamin B₁ 0.73, riboflavin 0.68, nicotinic acid 6.7, and vitamin C 36.7 mg.—M. B. Richards.

3565

ARESCURENAGA C., H. Contribución al estudio de la alimentación del indígena peruano. [Contribution to the study of the diet of the Peruvian native.] *An. Fac. Farm. Bioquim.*, Lima, 1952, 3, 116-121.

A diet study was made at the village of Sañus, 7 km. from the city of Huancayo.

Daily intakes per head of nutrients varied between the following limits: energy 755.0 to 1175.5 Cal., protein 6.9 to 23.9 g., fat 7.3 to 14.7 g., carbohydrates 151.2 to 248.0 g., P 66.7 to 137.5 mg. Intakes of Ca, Fe and vitamins were generally insufficient. The diet contained a high proportion of cellulose.

Among the recommendations made were that the natives should be educated in what foods are necessary, that they should be urged to grow them wherever possible, and that the cultivation of "tumbo" should be encouraged. This fruit belongs to the passion-fruit family, contains 92.3 mg.

vitamin C and 38.7 mg. P per 100 g., and grows well in the region investigated.—P. C. Jowsey.

See also Absts. 3186, 3293.

GENERAL STUDIES: DIET PLANNING: EDUCATION

3566

KING, C. G. **Recent research in nutrition.** *J. Amer. Dietetic Assoc.*, 1954, **30**, 13-16. [Dept. Chem., Columbia Univ., New York.]

3567

OLSON, R. E. **Current research in nutrition.** *J. Amer. Dietetic Assoc.*, 1954, **30**, 111-116. [Dept. Biochem. Nutrit., Grad. Sch. Pub. Health, Univ. Pittsburgh, Pa.]

3568

PI SUNER, A. Lo conocido y desconocido en nutricion. [The known and unknown in nutrition.] *Arch. venezol. Nutricion*, 1952, **3**, 273-285. English and German summaries.

A review.

3569

BROUWER, E. Melk en voedingsleer. [Milk and nutritional science.] *Voeding*, 1954, **15**, 2-15. [Lab. Physiol. Dieren, Landbouwhogesch., Wageningen.] English summary.

A historical review.

3570

WILLIAMS, C. D. **Self-help and nutrition. Real needs of "underdeveloped" countries.** *Lancet*, 1954, **266**, 323-325.

3571

Ante la III Conferencia sobre problemas de nutricion en America Latina. [Before the 3rd Conference on problems of nutrition in Latin America.] *Arch. venezol. Nutricion*, 1953, **4**, 113-151.

An account is given of material prepared for this Conference. It includes an account of the national nutrition programme, and of the incidence of endemic goitre and multi-deficiency disease in Venezuela.—I. Leitch.

3572

HERVEY, G. R. and McCANCE, R. A. **Emergency rations.** *Proc. Nutrition Soc.*, 1954, **13**, 41-45. [Med. Res. Coun. Dept. Exp. Med., Univ. Cambridge.]

3573

HUNDLEY, J. M. **Disaster feeding.** *J. Amer. Med. Assoc.*, 1953, **151**, 1404-1408. [Bethesda, Md.]

In this review the psychological and physiological bases of emergency feeding of the homeless and casualties are considered with special reference to the planning of civil defence in America (U.S.).

F. C. Aitken.

3574

RADHAKRISHNA RAO, M. V. **General instructions for civil hospital diets.** *Indian Med. Gaz.*, 1953, **88**, 594-598. [Dept. Nutrit., Haffkine Inst., Parel, Bombay 1.]

Tables are presented showing quantities of foods, nutrient composition and meal patterns of full and light diets, milk and buttermilk diets, high-protein and diabetic diets for vegetarians and non-vegetarians.—F. C. Aitken.

3575

SLEMENSON, C. G. Informe tecnico del servicio de alimentacion de providencia social (S.A.P.S.) del Brasil. [Organisation of the meals service of the social assistance (S.A.P.S.) in Brazil.] *Rev. Asoc. argent. Dietologia*, 1953, **11**, 62-71.

A lecture.

3576

OBERT, J. C. and PATTON, M. B. **Appraisal of school lunch programs. 3. Effect of management factors on nutritive value and pupil participation.** *J. Amer. Dietetic Assoc.*, 1953, **29**, 1211-1215. [Inst. Nutrit., Ohio State Univ., Columbus.]

See also Title 2272, Vol. 24.

3577

UPJOHN, H. L., SHEA, J. A., STARE, F. J. and LITTLE, L. **Nutrition of athletes.** *J. Amer. Med. Assoc.*, 1953, **151**, 818-819. [Dept. Nutrit., Harvard Sch. Pub. Health, Boston, Mass.]

The principles of nutrition of athletes are the same as those of nutrition of non-athletes. A nutritionally adequate diet in amounts sufficient for energy requirement and maintenance of desired bodyweight should be the rule. The timing of meals should be related to the times of exercise to allow of efficient digestion and efficient athletic performance.—F. C. Aitken.

3578

SMITH, H. G. **Army operational rations.** *Proc. Nutrition Soc.*, 1954, **13**, 45-48. [War Office, Kingston Barracks, Surrey.]

3579

WHITTINGHAM, D. G. V. **Royal Air Force emergency rations.** *Proc. Nutrition Soc.*, 1954, **13**, 49-53. [R.A.F. Inst. Aviation Med.]

N.A. and R., July 1954

3580

PLATT, B. S. and FOX, R. H. **Planning food supplies for tropical expeditions.** *Proc. Nutrition Soc.*, 1954, **13**, 53-60. [Human Nutrit. Res. Unit, Med. Res. Council Labs., Holly Hill, London, N.W.3.]

3581

PUGH, L. G. C. **Himalayan rations with special reference to the 1953 expedition to Mount Everest.** *Proc. Nutrition Soc.*, 1954, **13**, 60-69. [Div. Human Physiol., Med. Res. Council Labs., Hampstead, London, N.W.3.]

3582

GRONAU, H. **Über Brotanreicherung. [Enrichment of bread.]** *Ztschr. ges. inn. Med.*, 1953, **8**, 1000-1004. [Neubukow, Mecklenburg.]

The nutritional problems involved in enriching bread with vitamin preparations or with milk are reviewed.—A. M. Copping.

3583

BERTRAM, G. C. L. **The evolution of polar rations.** *Proc. Nutrition Soc.*, 1954, **13**, 69-73. [Scott Polar Res. Inst., Cambridge.]

3584

LECLERC, H. A propos du pois-chiche (*Cicer arietinum* L.) Son emploi dans l'alimentation et en thérapeutique. [**The chickpea (*Cicer arietinum*, L.), its use in feeding and in therapeutics.**] *Presse méd.*, 1954, **62**, 252.

3585

SURE, B. **A low-cost, high protein, low calorie food.** *J. Clin. Nutrit.*, 1953, **1**, 534-538. [Dept. Agric. Chem., Univ. Arkansas, Fayetteville.] Spanish summary.

The food is based on defatted soya flour, with dried non-fat milk solids, roughly ground whole wheat, vegetable shortening and tomato ketchup, and added vitamin B₁, riboflavin and nicotinic acid. It contains protein 17, fat 2.7, ash 3.0, Ca 0.3 and water about 60 per cent.; vitamin B₁ 8.1, riboflavin 7.1, nicotinic acid 31.1, pantothenic acid 8.2 and vitamin B₁₂ 0.1 µg. per g. Its protein value is claimed to be equal to that of beef and 92 per cent. of that of dried whole egg, but the energy value is only 750 Cal. per lb. It is said to have a nutty meaty flavour and a meaty texture and to have proved widely acceptable as a supplement or substitute for meat; some representative recipes are given. Commercial production is envisaged at an estimated cost of about 20 cents. per lb. can and 14 to 15 cents per lb. in 10-lb. cans for institutional use. It should be of use also for overweight persons.—W. M. Deans.

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3586

SAITO, S. **Clinical experiments of orally administering therapy of casein and defatted soya-bean hydrolysates.** *Tohoku J. Exp. Med.*, 1953, **59**, 97-104. [Med. Clin., Tohoku Univ., Sendai.]

An enzymic hydrolysate of defatted soya beans was cheaper and more palatable when given by mouth than an enzymic hydrolysate of casein, but much less effective in producing N retention and weight gains.—W. M. Deans.

3587

HIRSCHEL-KONIJN, M. and WIJERS, H. A. **Kleutervoeding. [The feeding of pre-school children.]** *Voeding*, 1954, **15**, 96-108.

An article for the use of teachers of nutrition.

3588

JANSEN, B. C. P. **Moderne voedingsleer. [Modern nutritional teaching.]** *Voeding*, 1954, **15**, 48-55. [Nederland. Inst. Volksvoeding, Amsterdam.]

A plan is outlined to publish a textbook of nutrition in instalments in this journal, as the American Medical Association did in 1942 (Title 2950, Vol. 12). Professor Jansen introduces the subject and will act as general editor.—I. Leitch.

3589

DARLING, C. D. and SUMMERSKILL, J. **Emotional factors in obesity and weight reduction.** *J. Amer. Dietetic Assoc.*, 1953, **29**, 1204-1207. [Dept. Clin. Prevent. Med., Cornell Univ.]

3590

MUNVES, E. D. **Dietetic interview or group discussion—decision in reducing?** *J. Amer. Dietetic Assoc.*, 1953, **29**, 1197-1203. [Dept. Nutrit., Home Econ. Dept., Sch. Educat., Univ. New York.]

3591

BOWSER, L. J., TRULSON, M. F., BOWLING, R. C. and STARE, F. J. **Methods of reducing. Group therapy vs. individual clinic interview.** *J. Amer. Dietetic Assoc.*, 1953, **29**, 1193-1196. [Dept. Nutrit., Harvard Sch. Pub. Health, Boston, Mass.]

3592

WINCKEL, C. W. F. **Rural social development in some countries of the Middle East.** *Doc. med. geogr.*, 1953, **5**, 235-246. [Inst. Trop. Hyg., Amsterdam.]

See also Absts. 2924, 3310.

FOOD ECONOMICS AND STATISTICS

3593

- HEALEY, D. T. **The problem of population growth.**
 NILSON, S. S. **Replies to Mr. Clark's article.**
Internat. Labour Rev., 1954, **69**, 68-73;
 73-76. [Dept. Appl. Econ., Univ. Cambridge;
 Central Bur. Statistics, Norway.]

The first of these replies is entitled "The problem of population growth". It rejects all or most of Clark's premises and arguments on potential production (Abst. 1044, Vol. 24) and appears to deduce opposition to family limitation: "we cannot stand aside and watch while the fruits of scientific efforts are nullified by the appearance of ever increasing numbers of mouths".

The second reply implies that Clark has underestimated the danger of growth of population. It discusses, on the basis of reports to the First All-

Indian Conference on Family Planning (Bombay, 1951), the acceptibility of family limitation by Far East, especially Indian, peoples.—I. Leitch.

3594

- FOX, F. W. **The agricultural foundations of nutrition. 1. Introduction. 2. Food resources in relation to population.** *S. African Med. J.*, 1954, **28**, 97-98; 178-179. [S. African Inst. Med. Res.]

2. This article gives urban and rural population statistics and estimates for South Africa and a comparison, quoted from the FAO "Second world food survey" (see Vol. 23, p. 470), of food supplies per head in South Africa, New Zealand and India.—W. M. Deans.

See also Abst. 4015.

DIET IN ETIOLOGY OF DISEASE

GENERAL STUDIES

3595

- GORDON, H. H., LUBCHENCO, L. and HIX, I. **Observations on the etiology of retrolental fibroplasia.** *Bull. Johns Hopkins Hosp.*, 1954, **94**, 34-44. [Dept. Paediat., Univ. Colorado, Denver.]

Information on the status of the eyes up to at least 3 months of age were available for 211 premature infants of birthweight less than 1.5 kg. who had been given oxygen in the premature infant centre. Data for 20 infants were obtained during about 3 years when the design of incubators and method of supplying oxygen probably gave moderate concentrations of oxygen (group 1). During the next 5 months more efficient incubators and a piped oxygen supply gave concentrations of 60 per cent. and over as shown by scattered analyses. Data for 20 infants cared for during this time are presented (group 2). There followed a transitional period of 3 months in which lower concentrations of oxygen were gradually introduced, when 14 infants were studied (group 3). Finally, during 2 years oxygen concentrations were restricted to 30 to 40 per cent. for 97 infants (group 4).

The incidence of residual lesions of retrolental fibroplasia and retrolental membranes, respectively, was 15 and 10 per cent. in group 1; 45 and 35 per cent. in group 2; 29 and 21 in group 3; 8 and 2 per cent. in group 4.

The results indicate that retrolental fibroplasia is a disease in the etiology of which high environmental oxygen is most important, but it is recognised that condition of the capillaries at birth, rate

of growth and dietary components such as electrolytes and tocopherol may play some part in the etiology of the disease.—F. C. Aitken.

3596

- COXON, M. W. **Experiences with retrolental fibroplasia in Oxford.** *Proc. Roy. Soc. Med.*, 1953, **45**, 863-865.

Since Owens and Owens (*Amer. J. Ophthalmol.*, 1949, **32**, 1631) claimed good results for vitamin E in prevention or arrest of retrolental fibroplasia, all premature babies born in the United Oxford Hospitals between April 1950 and May 1951 were treated from 1 week to 6 months of age with 150 mg. α -tocopherol acetate daily. Five developed retrolental fibroplasia and there was no evidence of any lessening of its severity.

Attention was later directed to the role of oxygen and this is now limited to the minimum necessary to prevent cyanosis, with an oxygen concentration not exceeding 40 per cent. and reduced gradually. If retrolental fibroplasia develops, adrenocorticotrophic hormone is given; vision was saved in the 11 cases treated so far.

W. M. Deans.

3597

- SPIES, T. D., DREIZEN, S., PARKER, G. S. and SILBERMAN, D. J. **Detection and treatment of nutritive failure in children; recent observations.** *J. Amer. Med. Assoc.*, 1952, **148**, 1376-1382. [Dept. Nutrit. Metabol., Northwestern Univ. Med. Sch., Chicago, Ill.]

A lecture report.

N.A. and R., July 1954

3598

POLUNIN, I. **The medical natural history of Malayan Aborigines.** *Med. J. Malaya*, 1953, 8, 55-114; 114a-174. [Dept. Soc. Med., Univ. Malaya.]

Census data are not complete for Malayan aborigines. In 1947, 35,000 were counted, but this may be an underestimate; there may be as many as 100,000. There are 3 main divisions, aboriginal Malays in South, Senoi in Central and Negritos in North Malaya. Three grades of economy are distinguishable, the simplest where a living is obtained by hunting, fishing and digging wild roots, the second and most widespread a system of shifting agriculture, and the third and most advanced with plantations of rubber and fruit trees.

Four groups were studied intensively in different areas, a method of study considered better than that of random sampling. They were (1) 171 Semai, the main southern group of Senoi, who had lived between 350 and 600 ft. above sea level, and (2) 178 Semai who had come from an altitude between 2750 and 4000 ft. Because of the internal troubles in the country these groups had, at the time of the survey, been evacuated to a lower altitude. Until their clearings came into bearing they were given a daily ration of rice, sweet potatoes, dried sprats, chillies and salt which provided 1300 Cal. per head. Group 3 was of 164 Negritos in Upper Perak whose shifting agriculture was haphazard, group 4 comprised 149 Orang Seletar; a people with a maritime or riparian mode of life in the south of Johore.

Vital statistics on the age of the subjects were unobtainable; there appeared to be a preponderance of young people, and of the 513 in the first 3 groups only 24 men and 19 women were classified as over 60 years of age. The excess of males over females was constant among nomadic aborigines. Child mortality was high. Heights were obtained for 297 adults over 20 years of age; the mean values in cm. and, in brackets, the numbers of those measured in the respective groups were, for men: 154.7 (50), 158.0 (35), 154.4 (41) and 162.9 (23) and, for women: 144.3 (44), 147.8 (43), 144.0 (42) and 150.4 (19). Data for weights are not considered representative because of the losses caused by the movement of the population during resettlement.

The information collected was primarily medical in nature and full details of the findings are presented. Disease of nutritional origin was not frequent. Among the Semai loss of weight as estimated from clinical examination was considerable in those from both altitudes but signs of deficiency of vitamin A, B vitamins, or vitamin D were not seen and on only few occasions were skin changes suggestive of dietary deficiency noted.

Angular stomatitis was seen in about 10 per cent. of the Semai but not in others. Thyroid enlargement, apparently from iodine deficiency, occurred in about 40 per cent. of the aborigines and neighbouring Malays. Enlargement of the parotid was common, palpable in 69 and visible in 33 per cent. of the population studied; incidence ranged from 85.8 to 56.4 per cent. Its possible relation to malnutrition and causation by work hypertrophy of the secretory cells are discussed.

Blood pressure, measured in a few Semai, was found to be low and to fall slightly with ageing. Hb was estimated by the modified cyanmethaemoglobin method of Cheek (*Trans. Roy. Soc. Trop. Med. Hyg.*, 1950, 44, 352) and Semai who had lived at the lower altitude where malaria, yaws and chronic pulmonary disease were common did not have lower Hb values than did Semai for the higher altitude who were relatively free from these illnesses.

The migration and resettlement of aborigines made necessary by the emergency have increased the death rate among those affected but epidemics have not occurred. The pattern of incidence of disease appears not to have changed but inadequate feeding may have played a part in reducing resistance among adults to diseases such as malaria, measles and dysentery and in increasing the hazards for infants by limiting lactation in the mothers.—D. Harvey.

3599

BLANCO OTERO, M., TARACENA DEL PIÑAL, B. and GARRIDO LESTACHE, J. Alimentación del niño español en relación con su crecimiento. [**Diet of the Spanish child in relation to growth.**] *Rev. española Pediat.*, 1953, 9, 951-965. [Sec. Fem. F.E.T. and J.O.N.S., Madrid.] French, English and German summaries.

A study of 8000 children between the ages of 3 months and 5 years, from all the Spanish provinces, showed a 10 per cent. retardation in the weight curve compared with what is regarded as normal. The retardation increased from about 9 months to a maximum in the second year. Estimation of food intake for the 24 hr. preceding the time of the body measurements showed deficits in the intakes of energy, protein and fats of 1/15, 1/10 and 1/7, respectively, of normal requirements, the deficit in energy being parallel to the deficit in bodyweight. The energy deficit from lack of fat and protein was made good in part by carbohydrates. These deficits gave rise in the more advanced stages to a clinical picture of grave malnutrition; when the signs were less marked, the condition might be wrongly diagnosed, in routine clinical work, as rickets.

M. B. Richards.

3600

WALLIS, A. D. **Dietary eggs and rheumatic fever.** WALLIS, A. D. and VIERGIVER, E. **Serum phospholipid and rheumatic fever.** *Amer. J. Med. Sci.*, 1954, **227**, 167-170; 171-178. [Ayer Clin. Lab., Pennsylvania Hosp., Philadelphia.]

The blood serum contains a substance which inhibits streptolysin S, one of 2 haemolysins produced by the group A beta haemolytic streptococcus which is believed to cause rheumatic fever. Since the activity of this inhibitor depends partly on the serum phospholipin content (see Wallis and Viergiver, *Amer. J. Med. Sci.*, 1954, **227**, 431), and this in turn on dietary choline, about half of which comes from eggs, 184 white and coloured patients, mainly adults and adolescents, and 1380 normal persons, were questioned about their present and past liking for and use of eggs. Ten per cent. of the cardiac patients, but just under 5 per cent. of the normal persons, expressed a present dislike of eggs. In both categories more females than males disliked eggs. Forty per cent. of the cardiac patients, but only 16 per cent. of the normal persons, said they had few eggs (4 or fewer weekly) in childhood, owing to dislike or poverty. Among patients with heart disease severe enough to require digitalis and those with 3 or more acute attacks of rheumatic fever, about 50 per cent. ate few eggs in childhood. It is suggested that individual differences not only in choline intake but also in choline requirement may affect susceptibility to rheumatic fever.

Lipoid P was estimated in the serum of 178 of the same patients, in all of whom the disease was inactive, and in a comparable number of normal persons. The results are shown graphically. For normal children and for normal adults between 20 and 39 years the respective mean values were 8.2 and 9.7 mg. per 100 ml. About 2/3 of the cardiac patients had values below average, but this difference was not found after age 35. Eighty per cent. of the cardiac patients had either a low serum phospholipin value or a low intake of eggs in childhood or both, and the percentage was even higher among those who required digitalis or who had had repeated attacks of rheumatic fever.

W. M. Deans.

3601

FRADÁ, G. and MENTESANA, G. Su alcuni rilievi nella fluorosi cronica. [**Observations on chronic fluorosis.**] *Boll. Soc. ital. Biol. sper.*, 1953, **29**, 750-753. [Ist. Patol., Univ. Palermo.]

Fluorosis caused by a high content of F in the drinking water is common in Sicily. Thirty-one men and women, fishermen and peasants, were examined. Dental fluorosis was severe, and there were complaints of dyspepsia and of pains in the joints, particularly of the legs. The red cell count

was low. X-ray examination showed skeletal changes and signs of gastroduodenal catarrh. In the blood serum alkaline phosphatase was somewhat high, inorganic P was usually normal, and total cholesterol was often low.—E. M. Hume.

3602

WADHWANI, T. K. **Prevention and mitigation of fluorosis (endemic).** 2. *J. Indian Inst. Sci.* [4], 1954, **36**, 64-69. [Sect. Pharmacol., Indian Inst. Sci., Bangalore 3.]

Earlier work on monkeys has been reported in Abst. 2504, Vol. 22.

A village was chosen in a district where fluorosis is endemic among humans and cattle and X-ray pictures were made of skeletons of 9 patients who were otherwise healthy but who had signs of fluorosis. For 6 weeks each was given 100 mg. vitamin C daily, after which additional X-ray examinations were made. These provided evidence of decrease in the size of the exostoses, and all patients reported less pain, a reduction in tingling sensations and improved movement of limbs. During the first 3 weeks of treatment all experienced more generalised pain.—D. Harvey.

DEFICIENCY DISEASES

General

3603

SYDENSTRICKER, V. P. **The impact of vitamin research upon medical practice.** *Proc. Nutrition Soc.*, 1953, **12**, 256-269. [Med. Coll. Georgia, Augusta.]

3604

SCHROEDER, H. Importancia de las vitaminas para la salud del hombre con excepcion de las avitaminosis. [**Importance of the vitamins for human health, apart from vitamin deficiencies.**] *Rev. clín. española*, 1953, **50**, 405-410.

A review.

3605

VINAŘICKÝ, R. . Pokus o zlepšení výkonnosti v běhu na střední vzdálenost vitaminy B₁, B₂ a C. [**An attempt to improve the efficiency of medium-distance runners by large doses of vitamins B₁, B₂ and C.**] *Scripta med.*, 1954, **27**, 1-18. [Physiol. Inst., Med. Fac., Masaryk Univ., Brno.] English and Russian summaries.

The effect of prolonged daily administration of vitamin B₁ 7 mg., riboflavin 5 mg. and vitamin C 300 mg. on the efficiency of runners in 800-metre races was investigated. The runners were identical twins with identical training and programmes, living conditions and sports records. Their food was planned and its vitamin content was in accordance with generally accepted requirements.

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During the experiment one of the twins took the additional vitamins in wafer capsules and the other took lactose and citric acid in similar capsules, neither knowing which was which. After several months the treatments were reversed. Such administration of vitamin B₁, riboflavin and vitamin C above the normal intake in food had no effect on efficiency as medium-distance runners, and it is concluded that allowances which suffice for hard work are sufficient also for athletes in hard training.—M. Prokšová (Czechoslovakia).

3606

MARÍA BENGÓA, J., VÉLEZ BOZA, F. and DE SHELLY HERNÁNDEZ, R. La mortalidad por enfermedades carenciales en Venezuela en el decenio 1940-1949. [Deaths from deficiency disease in Venezuela in the decennium 1940-1949.] *Arch. venezol. Nutricion*, 1953, 4, 85-112. [Inst. Nac. Nutric.] English and German summaries.

A study in Venezuela of the number of deaths due to deficiency diseases for the period 1940-1949 showed an average of 10 yearly per 100,000 inhabitants. Of these deaths 53 per cent. were of children from 1 to 4 years of age; in this age group 36 of every 1000 deaths recorded were due to deficiency diseases. Of these children 61 per cent. showed the syndrome of multiple deficiency known as kwashiorkor. The importance in the national campaign against malnutrition of directing special attention to the children of pre-school age is stressed.—M. B. Richards.

3607

BURGIO, G. R. and GIACALONE, O. Reperti elettroforetici nella distrofia del lattante. [Electrophoretic findings in infantile dystrophy.] *Boll. Soc. ital. Biol. sper.*, 1953, 29, 695-698. [Clin. Pediat., Univ. Palermo.]

A syndrome of multiple deficiency, common in Sicily, affects children of 2 years old or less. The signs include some of those of riboflavin deficiency, oedema and changes in the blood and liver. Electrophoretic analysis of the blood serum of 10 children with the syndrome and of 5 normal children showed increase of α -globulin and decrease of γ -globulin, the latter being directly related to the severity of the dystrophy. There was a decrease in the percentage of albumin which was well marked in 2 children only.—E. M. Hume.

3608

OOMEN, H. A. P. C. Preliminary survey on malignant malnutrition in Djakarta toddlers. *Doc. med. geogr.*, 1953, 5, 193-214. [Inst. Nutrit., Djakarta, Indonesia.]

The patients were selected as clear cases of malnutrition from out-patients attending the Central

Hospital, and represented a cross-section of the less prosperous urban population. It was obvious from the numbers seen, 146 in 2 months, that malnutrition was a serious problem in this population. In 100 consecutive cases studied, the usual signs of malignant malnutrition were present, the most striking and most frequent being retardation of growth, liver enlargement, emaciation, depigmentation of hair, and muscular atrophy; oedema was present in only 35 per cent. Other lesions not commonly seen in malignant malnutrition were xerophthalmia and keratomalacia, which were present in 71 and 47 per cent. of the cases, respectively. Liver biopsy on 46 patients showed moderate or severe steatosis in 40, slight fibrosis in 27, and slight cellular infiltration in 27. The mortality rate was high. The eye lesions were evidence of vitamin A deficiency, but xerophthalmia alone, without signs of general malnutrition, was rare. A dietary investigation showed that most of the children were breast fed for the first year and were then weaned on to a rice diet often low in energy and deficient in protein. Dysentery, tuberculosis and other infections were frequently present, and apparently played an important part in the etiology. In many instances the faulty diet was due to ignorance rather than to poverty. A high-protein diet cured many patients.

L. Wills.

3609

DEAN, R. F. A. Treatment and prevention of kwashiorkor. *Bull. World Health Organiz.*, 1953, 9, 767-783. [Med. Res. Counc. Group Res. Infantile Malnutrit., Kampala, Uganda.] French summary.

In this expansion of a communication to the Conference of the *Centre International de l'Enfance* held at Brazzaville in 1952 the work in progress at Kampala is summarised. Treatment first with milk concentrates and later with soya beans as sources of protein was tried and the preparation of a soya-banana diet which has been found to be satisfactory is described in detail.

The economic implications of a number of different ways in which protein might be made available in larger amounts for the population of the East African territories are considered, and the view is expressed that, while animal sources should continue to be developed, they are unlikely to be able to supply the needs fully. Plant proteins have provided promising results and further investigation, especially of a combination of sunflower seeds and soya beans, is recommended.—D. Harvey.

3610

JANSSEN, E. Enkele opmerkingen over kwashiorkor. [Some observations on kwashiorkor.]

Maandschr. Kindergeneesk., 1953, **21**, 281-294.

[Dept. Paediat., Gen. Hosp., Pretoria, S. Africa.]

See Abst. 1069, Vol. 24.

3611

SODEMAN, W. A. and MUKHERJI, K. L. **Some observations on malnourished patients with edema.** *J. Lab. Clin. Med.*, 1953, **42**, 954-955. *Proc.* [Columbia, Mo.]

3612

LULLA, B. N. **Nutritional oedema in Sindhi evacuees. A clinical study.** *Antiseptic*, 1953, **50**, 789-793. [Pravin Court, Queen's Rd., Bombay.]

Diet histories, clinical features and laboratory findings in 12 cases are described. Diets were low in protein, vitamins and Fe. Anaemia was commonly associated with the oedema. Low blood plasma protein was the most significant laboratory finding, and the oedema was attributed to chronic protein deficiency.—F. C. Aitken.

3613

MEYERINGH, H. **Über Spätfolgen der Dystrophie. [Late effects of dystrophy.]** *Deutsch. med. Wochenschr.*, 1954, **79**, 241-242. [Landesversorgungsamts, Schleswig-Holstein.]

Report of a lecture. Among 56,000 former prisoners of war in Schleswig-Holstein, of whom many had had 3 or 4 years' captivity and all were more or less dystrophic, 8 have been found with organic brain disease due to dystrophy. The incidence of liver damage and disturbances of the nervous system, but not of organic heart disease, is higher than in the general population; fewer of the ex-prisoners show raised blood pressure.

W. M. Deans.

See also Abst. 3792.

Vitamin A

3614

PESKIN, J. C. **Effects of vitamin A on visual threshold.** *J. Appl. Physiol.*, 1953, **6**, 375-378. [Dept. Biol., Univ. Rochester, N.Y.]

Subjects whose dietary conditions had been nearly identical for several months before their selection and whose visual threshold, measured with the adaptometer of Hecht and Schlaer, was below 3.60 (log I $\mu\mu$ lamberts) were divided into two groups. The first group of 20 was left untreated and the second of 40 was given 50,000 I.U. vitamin A as a concentrate, daily for 35 days during which the threshold of each subject was tested every 4 to 6 days. The average threshold of those untreated remained constant. Of the 40 subjects receiving vitamin A, the average threshold of 34 fell by less than 0.07; that of the other

6 showed a steady decline from an initial value of 3.35 to a final one of 2.72 after 35 days.

R. J. Ward.

3615

MENDELOFF, A. I. **The effect of eating upon the absorption of vitamin A.** *J. Lab. Clin. Med.*, 1953, **42**, 924-925. *Proc.* [St. Louis, Mo.]

3616

LAHIRI, K. D. and SCANDRETT, F. J. **High vitamin A levels in the blood serum in certain skin diseases.** *Indian Med. Gaz.*, 1953, **88**, 639-641. [Dept. Dermatol., Royal Infirmary, Edinburgh.]

Carotene and vitamin A were estimated in the blood serum of patients in the Dermatological Department of the Royal Infirmary, Edinburgh, and the results were compared with values obtained for normal healthy subjects. Patients with psoriasis showed consistently high vitamin A values, the average in I.U. per 100 ml. for 17 being 223 compared with 187 for 114 normal controls. Values for carotene in I.U. per 100 ml. averaged 57.5, and were near to the average of 69 for the normal controls. Patients with other skin diseases also had high vitamin A values. The average for 15 patients with *lichen planus* was 252, for 6 with *lupus erythematosus* 210, and for 2 with *keratoderma palmaris et plantaris* 212. The last named patients had been given 100,000 I.U. vitamin A daily by mouth for 3 months. The respective average values for carotene were 81.2, 38.7 and 65.0, and were not, therefore, substantially different from those of normal controls. These preliminary results did not allow any definite conclusion to be drawn about abnormalities of vitamin A metabolism in these skin diseases, but it is suggested that there may be failure of normal utilisation.

I. M. Sharman.

See also Abst. 3700.

Vitamin E

3617

GORIA, A. **Rirespirazione di miscele a bassa concentrazione di O₂. [Re-respiration of mixtures with a low concentration of oxygen.]** Effetti, nell'uomo, dell'alfatocoferolo sulla frequenza cardiaca. [Effect of α -tocopherol on the heart frequency in man.] Effetti del tocoferolo sui caratteri dell'elettrocardiogramma dell'individuo normale a riposo. [Effects of tocopherol on the electrocardiogram of normal subjects in repose.]

GORIA, A. and MALLIN, J. **Effetti dell'alfatocoferolo sull'elettrocardiogramma. [Effects of tocopherol on the electrocardiogram.]** *Boll. Soc. ital. Biol. sper.*, 1953, **29**, 1275-1276; 1277-1278; 1278-1279. [Ist. Fisiol., Univ. Turin.]

Two young adults took orally 100 mg. DL- α -tocopheryl acetate daily for 10 days and then 300 mg. daily for 10 days. On the 20th day, while at rest, they breathed for 3 min. a concentration of O₂ as low as could be tolerated, to the point of losing consciousness. The experiments were repeated 2 months later without previous administration of tocopherol. The progressive increase of pulse rate during the 3 min. test was less when tocopherol had been taken.

In the same circumstances, the electrocardiogram recorded prolongation of both systole and diastole when vitamin E had been given; the effect on diastole was the greater.

The other changes in the electrocardiogram promoted by a low O₂ concentration were to some extent favourably modified when vitamin E had been given.—E. M. Hume.

3618

GOUNELLE, H., MARNAY, C. and BLONDIN, M. Les troubles d'absorption de la vitamine E chez les sujets gastrectomisés. [**Disturbances of vitamin E absorption in gastrectomised subjects.**] *C.R. Soc. Biol.*, 1953, **147**, 1598–1599. [Centre Recherches Foch, Paris.]

The absorption of vitamin E was studied in 9 gastrectomised subjects. The vitamin was estimated in the serum of each patient, fasting and 6 hr. after taking 2 g. free α -tocopherol. Seven of the patients had been gastrectomised between 3 weeks and 2 months previously. The remaining 2 were gastrectomised 3 and 4 years earlier. The average percentage rise in the recently gastrectomised patients was 41 per cent., which is much less than the value of 118 previously reported (Abst. 2324, Vol. 24) for normal subjects. Faulty absorption of the vitamin was also shown in the long-standing gastrectomised subjects, the percentage rises for these being 24 and 70 per cent.

I. M. Sharman.

3619

SUTTON, D. C., SUTTON, G. C., HINKINS, G. F., BUCKINGHAM, W. B. and RONDINELLI, R. **Studies on whole blood and muscle creatine levels: effect of systemic and local anoxia, of cardiac failure and compensation, and of alpha-tocopherol administration.** *Amer. Heart J.*, 1954, **47**, 67–76. [Preble Res. Lab., Cook County Hosp., Ill.]

In 40 healthy subjects, mostly male, the whole blood contained from 1.0 to 2.6, mean 1.6, mg. per cent. creatine, estimated chemically. In 118 patients, cases of anaemia, anoxia, azotaemia and cardiac failure being excluded, values of from 1.6 to 2.9, mean 2.2 were found, but the difference between the healthy and the sick group was not statistically significant. Muscle obtained by biopsy

from 5 male patients with different diseases contained from 235 to 365 mg. per cent. In 16 subjects in which blood was first taken from the right arm, and next from the left arm after constriction for 20 min., increases of from 0.9 to 6.7, mean 2.4, mg. were found. In 17 patients with cyanosis or anaemia the blood values were from 3.1 to 4.9, mean 3.9, and in 150 patients with cardiac failure from 3.0 to 10.7, mean 5.2. In 25 cardiac patients serial estimations were made, and high values were gradually attained in 4 fatal cases. In 10 patients in whom compensation was effected by treatment with digitalis, barbitol and diuretics the average creatine content of the muscles rose from 256 to 330 mg. per cent. and that of the blood fell from 6.2 to 3.4 mg. per cent. When daily doses of 50 mg. α -tocopherol were given in addition to the other drugs, the increase of creatine in the muscle was somewhat greater, from 245 to 412, and again there was a fall from 6.2 to 3.4 in the blood values.

T. Moore.

3620

NUÑEZ MELGAR Z., Y. Variaciones de la creatinuria por influjo del alfa-tocoferol. [**Changes in excretion of creatine under the influence of α -tocopherol.**] *An. Fac. Farm. Bioquim., Lima*, 1952, **3**, 325–340. [Hosp. 2 de Mayo, Lima.]

Creatine and creatinine were estimated by photolorimetric methods in the urine of patients with cardiac or muscular disturbances or signs of senility. In muscular disturbances excretion of creatine was high and fell when α -tocopherol was given orally or by injection. Doses of from 20 to 60 mg. were used and the greatest effect was obtained with oral administration.

In senile patients and those with cardiac lesions the amount of creatine in the urine rose with increasing doses of tocopherol. The results of studies on 28 patients are set out in tables and graphs.—A. M. Copping.

3621

WILSON, M. G. and PARRY, E. W. **Clinical trial of alpha-tocopherol in the prophylaxis of thrombo-embolism.** *Lancet*, 1954, **266**, 486–488. [Royal Infirmary, Bristol.]

Daily doses of 200 mg. α -tocopheryl acetate and intravenous injections of 10 ml. of 10 per cent. calcium gluconate every 48 hr. were given to 100 surgical patients, over 40 years old, of both sexes; 100 untreated patients acted as controls. In the treated patients mild deep thrombosis occurred in 7, and mild superficial thrombosis developed in 3. In the untreated patients non-fatal pulmonary embolism occurred in 2, severe thrombosis in 9, mild deep thrombosis in 3, and severe superficial

thrombosis in 1. The tocopherol therefore appeared to have some value in preventing thrombosis. Subsequently 3 groups of patients were left untreated, or were treated with α -tocopheryl acetate, calcium gluconate and vitamin D by mouth, or with α -tocopheryl acetate only. The incidence of cases of thrombosis in the 3 groups was 7, 5 and 2, respectively.—T. Moore.

3622

PULT, H. Erfahrungen bei der Behandlung der Kollagenosen mit Vitamin E. [**Treatment of collagen conditions with vitamin E.**] *Deutsch. med. Wochenschr.*, 1954, **79**, 471-472; 481-483. [Krankenhaus Maria Hilf, München-Gladbach.]

Daily doses of from 300 to 400 mg. α -tocopherol, usually combined with X-ray treatment, were helpful in treating 4 patients with contractures of the hand or wrist, 8 with indurations of the penis, 5 with wound keloids and one with scleroderma.

T. Moore.

3623

CONWAY, H. **Dupuytren's contracture.** *Amer. J. Surg.*, 1954, **87**, 101-119. [Dept. Plastic Surg., New York Hosp.]

α -Tocopherol was given to 12 patients after operation for Dupuytren's contracture without beneficial result, and in one the condition developed in the other hand during treatment.

W. M. Deans.

See also Absts. 3595, 3596.

Vitamin B Complex

3624

WILLIAMS, R. R. **The world beriberi problem today.** *J. Clin. Nutrit.*, 1953, **1**, 513-516. [Williams-Waterman Fund for Combat of Dietary Dis., Res. Corp., 405 Lexington Av., New York.]

In Japan the death rate from beriberi was 44 per 100,000 in 1923 but was falling gradually before the last war, when a further fall to 6 per 100,000 occurred as the result of restricting to 5 per cent. the amount of bran removed from rice. In the Philippines better medical attention in the towns has reduced the death rate. For other Asian countries statistics are less complete and there are still regions, especially in areas of industrial development, where beriberi is endemic. It is suggested that the sale of white rice should be prohibited. In Bataan a large-scale experiment showed that consumption of fortified rice reduced the beriberi mortality to a negligible level. Control of the milling and parboiling processes would have the same effect and would be more consistent with the type of economy prevalent in Asia.

L. Wills.

3625

CHHUTTANI, P. N. and TAYLOR, G. F. **Nutritional peripheral neuropathy related to "the shoulder girdle syndrome" in Persia and Iraq force 1944-45.** 1. 2. *Indian Med. Gaz.*, 1953, **88**, 509-520; 563-570. [Dept. Clin. Med., Med. Coll., Amritsar.]

1. Observations are reported on 83 cases of which 13 are described in detail.

2. Differential diagnosis from other peripheral nerve lesions is discussed; fibrositis, sciatica, poliomyelitis and particularly neural leprosy must be excluded.

Fifty-one patients responded to treatment with vitamin B₁, and 6 recovered slowly on a full hospital diet without added vitamin B₁. The degree of recovery depended on the severity of muscular wasting or the extent and duration of sensory loss. Severe lesions were often crippling.

The etiology of the syndrome is discussed at length; the rations were supposed to provide 3 mg. vitamin B₁ daily, but appetites were poor and vegetarians were selectively affected. The form of onset and course and the response to vitamin B₁ suggested that the syndrome was atypical beriberi. The part played by fatigue also is discussed. It is suggested that fatigue may have contributed to the preponderance of right-sided lesions.—L. Wills.

3626

ISERI, L. T., UHL, H. S. M., CHANDLER, D. E., BOYLE, A. J. and MYERS, G. B. **Fluid and electrolyte balance during recovery from high-output heart failure due to beri-beri.** *Circulation*, 1954, **9**, 247-254. [Dept. Med., Coll. Med., Wayne Univ., Detroit, Mich.] Spanish summary.

Detailed metabolic studies on 3 patients recovering from beriberi after long histories of chronic alcoholism showed that during recovery there was in each a great uptake of potassium by the cells, which in one was associated with sodium retention, and in two with significant loss of intracellular water. This movement of electrolytes during recovery was presumed to depend on osmotically active cellular base becoming inactive, which occurs also in low-output heart failure.

L. Wills.

3627

HÖÖK, O. **Polynuritis caused by hydrazide of isonicotinic acid. A report of 7 cases.** *Acta med. scand.*, 1953, **147**, 167-174. [Neurol. Clin., Serafimerlasaret, Stockholm.]

In the course of treatment with isonicotinic acid hydrazide, given alone or with *p*-aminosalicylate or dihydrostreptomycin, 7 patients with tuberculosis developed signs and symptoms of

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peripheral neuritis. The daily dose used was from 6 to 10 mg. per kg. bodyweight in 6, and 5 mg. per kg. in the seventh. Symptoms appeared from 2 weeks to 3 months after the start of treatment. The first symptom to appear was paraesthesia of the soles of the feet, followed in some by loss of vibration sense, increased muscle reflexes in the lower limbs and hyperalgesia of the soles of the feet. The electromyogram was typical of a peripheral nerve lesion. The symptoms cleared up rapidly in most patients when the drug was withdrawn.—L. Wills.

3628

RÄTHÄ, C. E. and FORSANDER, O. **The cocarboxylase content of the blood in children.** *Acta paediat.*, 1953, **42**, 514–519. [Child. Clin., Univ. Helsinki.] French, German and Spanish summaries.

Cocarboxylase was estimated manometrically in the blood of 120 subjects aged from 0 to 25 years. The average value was higher in the younger children, decreased with age, particularly in the first year, and then remained constant after 7 years of age. The cocarboxylase content of cord blood from newborn infants was higher than in maternal blood, in which it was a little below the average for adults. The values were 8.1 μ g. per 100 ml. for maternal blood, 13.7 for full-term infants and about 10 for premature infants.

There was some correlation between erythrocyte count and cocarboxylase content, but there must also be some connection with the blood content of pyruvic acid, which decreases with age, and with the metabolism of which cocarboxylase is closely concerned.—V. R. Jackson.

3629

BOTTOLI, A. **La cocarbossilasi nel trattamento della neuriti da zoster. [Cocarboxylase in the treatment of herpes neuritis.]** *Arch. ital. dermatol.*, 1953, **25**, 453–456.

3630

NICHELE, G. and SIGLIANTI, L. **Correlazioni inter-vitaminiche: influenza della cocarbossilasi sulla eliminazione urinaria di acido nicotinico e trigonellina. [Relations between vitamins: influence of cocarboxylase on the urinary excretion of nicotinic acid and trigonellin.]** *Arch. ital. Pediat. Puericoll.*, 1953, **16**, 263–283. [Ist. Clin. Pediat., Univ. Rome.] French, English and German summaries.

Nicotinic acid was estimated by the CNBr method, and trigonellin by the method of Roggen, in the urine of 15 children aged from 8 months to 11½ years, recovering from various diseases in hospital on a normal, complete diet. Nicotinamide, 100 mg., was given parenterally on 3

successive days, on the last 2 of which 50 mg. cocarboxylase also were given. The amount of nicotinic acid excreted in the urine in the 24 hr. after administration of nicotinamide was increased on the average by 5.57 mg. but, on the first day after cocarboxylase was given also, there was an average decrease below the initial value of 1.17 mg., and on the second day of 2.27 mg. The corresponding values for trigonellin excreted in the 24 hr. were increases of 13.39, 25.00 and 26.58 mg.

E. M. Hume.

3631

WALKER, A. R. P. **Low niacin concentration in the breast milk of Bantu mothers on a high-maize diet.** *Nature*, 1954, **173**, 405–406. [Human Biochem. Unit, S. African Inst. Med. Res., Johannesburg.]

Nicotinic acid and tryptophan were estimated microbiologically in breast milk from urban Bantu mothers in whose diet maize meal of from 90 to 100 per cent. extraction supplied up to 85 per cent. of the calories, from Indian and Eurafican mothers consuming small variable quantities of maize, from Bantu and Indian mothers on European diet, and from European mothers in comfortable circumstances. No difference due to race was found. Despite a higher intake of nicotinic acid, milk from Bantu mothers on the high-maize diet contained considerably less than that from Bantu mothers on European diet, the average being 70 μ g. per 100 ml. The mean values for the other 3 groups in the above order were 105, 150 and 175. The mean tryptophan contents in mg. per 100 ml. were 23 for Bantu and 21 for Europeans. The low nicotinic acid content of Bantu milk appeared to be due to abnormalities of metabolism associated with a high maize intake but further investigation is needed to determine the cause.

The low content of nicotinic acid in the milk had no apparent effect on the growth and health of the Bantu infants, which were comparable with those of European infants completely breast fed to 6 months of age.—V. R. Jackson.

3632

NOVAKOVSKAYA, A. A. and TIKHOMIROVA, A. N. **Izuchenie obmena nikotinovoi kisloty u bol'nykh dizenteriei. [Nicotinic acid metabolism in dysentery.]** *Vop. Pitan.*, 1954, **13**, No. 1, 15–21. [Kaf. Infektz. Bolezn., 1. Mosk. Ord. Lenin. Med. Inst.]

The excretion of N¹-methylnicotinamide in the urine and the level of dipyrindine nucleotide (D.P.N.) in the blood were studied in an attempt to estimate any change in the metabolism of nicotinic acid in 26 acute and 21 chronic cases of dysentery at 3 stages in the illness. Half the number of patients in each group had their diet

supplemented with curds, increasing its protein and tryptophan content. In acute cases without dietary supplement convalescence coincided with an appreciable fall in excretion of N¹-methylnicotinamide not found in chronic cases. D.P.N. levels in blood were little changed. In patients with a dietary supplement N¹-methylnicotinamide in urine reached lower, and D.P.N. in blood higher, levels than in those not given any supplement. Changes in total plasma protein and in albumin and globulin fractions also indicated benefit from the supplement.—D. W. Taylor.

3633

ANDREU URRA, J., RIVERO FONTAN, J. L. and ZOFFMANN, A. El componente hemolítico en la anemia de la pelagra. [The haemolytic component in the anaemia of pellagra.] *Rev. española Enferm. Apar. digest. Nutricion*, 1954, **13**, 3-5. [I. Clin. Med., Univ. Seville.]

Of 53 patients with pellagra 49 were found to be anaemic. Blood studies showed different forms of anaemia, but gave little or no evidence of haemolysis. In 7 of 8 patients who gave a positive reaction for urobilin in the urine, the anaemia was hypochromic and normocytic; in the other patient it was normochromic.

A. M. Copping.

3634

CHLÁDEK, V. Léčení Menièrovy choroby látkami vysokého biologického účinku ze skupiny vitaminů. [Treatment of Menière's disease with a vitamin substance of high biological activity.] *Čas. Lék. čes.*, 1953, **92**, 1241-1245. [Otorhinolaryngol. Clin., Prague 12.] Russian and English summaries.

Lack of riboflavin was found in 45 per cent. of cases of Menière's disease, and lack of nicotinic acid was diagnosed from the state of the tongue in 50 per cent. Treatment with the two vitamins and with pyridoxine afforded considerable relief. Ascorbic acid was not found to confer any benefit. (From summary.)—E. M. Hume.

3635

COMACHO COMITRE, L. Determinación fluorométrica de riboflavinuria en mujeres aparentemente sanas y gestantes. [Fluorometric estimation of riboflavin in the urine of apparently healthy and of pregnant women.] *An. Fac. Farm. Bioquim., Lima*, 1952, **3**, 289-295. [Lab. Farmacol., Univ. Lima.]

Riboflavin was estimated by the method of Najjar (Abst. 2973, Vol. 11) in one-hour urine samples from 20 apparently healthy young women and from 20 pregnant women. The amounts of riboflavin excreted by the non-pregnant women varied from 0 to 50 μ g. [given as g.] per 10 ml.

urine with a mean value of 22.8 μ g. In pregnant women the values were lower, ranging from 0 to 18 μ g. per 10 ml. with a mean value of 4.5 up to the seventh month and 7.0 in the eighth and ninth months. The values are lower than those reported by other observers and suggest the possibility of riboflavin deficiency in the diet of the people of Lima.—A. M. Copping.

3636

JANSEN, A. P. and JANSEN, B. C. P. The riboflavin-excretion with urine in pregnancy. *Internat. Ztschr. Vitaminforsch.*, 1954, **25**, 193-199. [Netherlands Inst. Nutrit., Univ. Amsterdam.] French and German summaries.

Riboflavin was estimated chemically in 24-hr. samples of urine from 167 women between the second and ninth months of pregnancy. They were divided into 4 groups with estimated daily intakes of under 1.0 mg., 1.0 to 1.5 mg., 1.5 to 2.0 mg., and over 2.0 mg. Less than 5 per cent. had an intake of 2.5 mg., the recommended daily allowance of the [presumably U.S.] National Research Council. Results were compared with those for 82 samples from non-pregnant women aged from 20 to 40 years, of whom 24 per cent. had the recommended daily allowance of 1.5 mg.

There was no significant difference in riboflavin excretion between pregnant and non-pregnant women with an intake of less than 1.0 or more than 2.0 mg. With intakes of from 1.0 to 1.5 and from 1.5 to 2.0 mg., the differences in excretion were highly significant. For all groups taken together the excretion of riboflavin by the pregnant women was significantly less than by the non-pregnant women even when the intake of the former was considerably higher, which suggests an increased need during pregnancy.

Comparison of women in the first to third, fourth to sixth, and seventh to ninth months of pregnancy showed that the need was slightly increased during the first 3 months and greatly increased during the last 6. It is concluded that pregnant women need about 2.0 mg. daily.

The results are examined statistically.

V. R. Jackson.

3637

LUST, J. E., HAGERMAN, D. D. and VILLEE, C. A. The transport of riboflavin by human placenta. *J. Clin. Invest.*, 1954, **33**, 38-40. [Res. Lab., Boston Lying-in Hosp., Mass.]

Riboflavin was estimated by the photofluorimeter in the placenta and in maternal and cord blood obtained during 10 normal deliveries. The mean total riboflavin content of foetal serum was 3.70 μ g. per 100 ml., that of the maternal serum 3.07; the difference was due mainly to free riboflavin, of which the foetal serum had about 4 times

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as much as the maternal serum. The flavin adenine dinucleotide content of maternal serum was about twice that of foetal serum. The placenta contained on the average 214 μ g. of total riboflavin per 100 g. wet tissue, of which 205 μ g. were flavin adenine dinucleotide and only 9 μ g. free riboflavin and riboflavin mononucleotide. The placenta was shown *in vitro* to contain a substance, presumably an enzyme, capable of splitting adenine dinucleotide to the mononucleotide and free riboflavin; it is suggested that it is the mechanism used in transferring riboflavin from mother to foetus.—L. Wills.

3638

ALLEGRA, G. and NIUTTA, R. Ricerche sui bilanci e sulle relazioni di equilibrio di alcune vitamine (riboflavina, acido folico, vitamina B₁₂) in soggetti normali e in pazienti con sindromi intestinali croniche. 1. Il bilancio della riboflavina. [Studies of the balance and equilibrium relationships of some vitamins (riboflavin, folic acid, vitamin B₁₂) in normal subjects and patients with chronic intestinal disturbances. 1. Riboflavin balance.] *Acta vitaminol.*, 1953, 7, 246-252. [Ist. Clin. Med. Gen., Univ. Messina.] French, English, German and Spanish summaries.

Subjects were maintained for 5 days on a standard diet containing about 0.35 mg. riboflavin per 1000 Cal. After fasting for 16 hr. they were given 2 mg. riboflavin intravenously, and were kept fasting for a further 24 hr., during which urine was collected. The same procedure was followed without injection of riboflavin. Riboflavin was estimated fluorimetrically. In 5 healthy subjects the mean percentage of the test dose excreted in the first 24 hr. was 56, the peak of elimination being reached in the first half-hour. In 13 subjects with chronic intestinal disorders and no sign of riboflavin deficiency the mean percentage was 41, and in 10 similar subjects but with signs of riboflavin deficiency it was 33. The peak of excretion in both groups was in the first hour.—E. M. Hume.

3639

BARBIERI, L. L. and BRUNELLI, M. A. Contributo allo studio delle variazioni del metabolismo glucidico indotte dalla riboflavina e dal suo estere monofosforico. [Changes in carbohydrate metabolism induced by riboflavin and its monophosphate ester.] *Internat. Ztschr. Vitaminforsch.*, 1954, 25, 157-169. [Ist. Clin. Med., Univ. Bologna.] English, French and German summaries.

Sugar and pyruvic and lactic acids were estimated in the blood of 10 healthy persons and 12 patients with cardiac decompensation before and

1, 2 and 3 hr. after intravenous administration of 20 mg. riboflavin or its monophosphate ester, alloxazine mononucleotide.

The effect on blood sugar of either substance was small. In both healthy subjects and patients there was a small increase in the first hour after riboflavin, and a longer delayed, small increase after the ester.

The value for blood pyruvic acid after administration of either substance rose in the healthy subjects, with the peak in the first hour. In the patients it was not consistently affected after riboflavin, but rose as in the healthy subjects after the ester.

The value for blood lactic acid fell in the healthy subjects after riboflavin or the ester, the value usually being lower in the third hour than in the first. In the patients the response to riboflavin was irregular; all except one showed a reduction at some time, but the decrease might be greatest in the first, second or third hour. The response to the ester was usually a progressive decrease.

It is concluded that in patients with cardiac decompensation the phosphorylation of riboflavin is disturbed.—E. M. Hume.

3640

BOLDRINI, R. and MONTENERO, P. Eliminazione urinaria della lattoflavina totale in corso di scompenso cardiaco. 2. Influenza della cocarbossilasi sulla lattoflavinuria degli scompensati. [Urinary excretion of riboflavin in cardiac decompensation. 2. Effect of cocarboxylase on the urinary riboflavin in cardiac decompensation.] *Acta vitaminol.*, 1954, 8, 3-6. [Ist. Clin. Med., Univ. Rome.] French, English, German and Spanish summaries.

For Part 1 see Title 3477, Vol. 23.

Riboflavin was estimated in the urine of 6 patients with cardiac decompensation, treated with digitalis, before and after a single intravenous injection of 100 mg. cocarboxylase. The value fell immediately after the injection by a percentage ranging from 24 to 35, and returned to the initial value in 3 days.—E. M. Hume.

3641

BENEDETTI, A. Segni di ariboflavinosi in corso di cirrosi epatica. Presenza di riboflavina nell'ascite. [Signs of riboflavin deficiency in the course of liver cirrhosis. Presence of riboflavin in the ascitic fluid.] *Acta vitaminol.*, 1953, 7, 260-264. [Ist. Clin. Med., Univ. Modena.] French, English, German and Spanish summaries.

An account is given of 3 patients with liver cirrhosis and ascites, which had necessitated frequent tapping. All had tongue changes characteristic of riboflavin deficiency.

Riboflavin was estimated fluorimetrically in ascitic fluid and pleural exudates of 10 patients. The concentration ranged from 20 to 150 μg . per litre. The loss of riboflavin by tapping is considered to be possibly of significance.

E. M. Huime.

3642

ESCHE, H. Stottern—Symptom einer Hypovitaminose. [Stammering as sign of a vitamin deficiency.] *Münch. med. Wochenschr.*, 1953, **95**, 1135. [Sebexen über Kreinsen.]

A favourable preliminary result was obtained when stammering children aged from 4 to 9 years were treated with B vitamins as 25 drops Polyvital daily.—E. M. Huime.

3643

STANGL, E. Studien über den Einfluss der Pantothenensäure auf den Blutzucker des Menschen. [Effect of pantothenic acid on blood sugar in man.] *Internat. Ztschr. Vitaminforsch.*, 1954, **25**, 135–138. [Med. Klin., Univ. Innsbruck.] French and English summaries.

Intravenous injection of from 100 to 500 mg. pantothenic acid reduced the fasting blood sugar value in 10 subjects tested at an altitude of about 5000 ft. At 1800 ft. also the blood sugar value fell in 3 diabetic subjects, but in 6 healthy subjects and one with diabetes insipidus the value rose in response to a dose of 500 mg. pantothenic acid. In discussing the observations it is suggested that pantothenic acid may affect the beta cells of the islets of Langerhans.—A. M. Copping.

3644

HART, P. L. DE V. Carcinoma complicated by proximal motor neuropathy due to vitamin-B deficiency. *Brit. Med. J.*, 1954, i, 606–609. [Royal Cancer Hosp., London.]

Two types of neuropathy associated with cancer are reported, one chronic, peripheral, and associated with sensory symptoms, and one affecting the proximal musculature, with few sensory symptoms and sometimes with rapid and severe involvement of the brain stem. Two cases of the latter type are reported. One patient improved dramatically under treatment with the vitamin B complex and there was suggestive evidence that the neuropathy was improved by administration of pyridoxine or pantothenic acid; associated myocardial weakness responded to vitamin B₁. In the other patient great muscle weakness improved with pyridoxine. It is suggested that the symptoms develop as a result of competition for the vitamins by the tumour cells.—L. Wills.

3645

NEUWEILER, W. and FISCHER, H. Über das Vitamin B₆ in der Frauenmilch. [Vitamin B₆

in human milk.] *Internat. Ztschr. Vitaminforsch.*, 1954, **25**, 205–209. [Frauenklin., Univ. Berne.] English and French summaries.

Vitamin B₆ was estimated microbiologically with *Saccharomyces carlsbergensis* and a mutant of *Neurospora sitophila*. The amounts found, in μg . per 100 ml., were from 15 to 20 in human milk and 120 in cow's milk. Oral administration of 60 mg. vitamin B₆ daily for 3 days caused a marked rise in the amount in the milk. The values fell again 6 to 9 hr. after a single dose and after 3 days even if the vitamin was continued.—A. M. Copping.

3646

MOLONY, C. J. and PARMELEE, A. H. Convulsions in young infants as a result of pyridoxine (vitamin B₆) deficiency. *J. Amer. Med. Assoc.*, 1954, **154**, 405–406. [Child. Hosp., Los Angeles, Calif.]

A peculiar disorder occurring in young infants, characterised by epileptiform convulsions not associated with any other sign of illness or with laboratory findings suggesting any etiological cause, was reported first from scattered areas and finally from all parts of the country. The one thing common to all was that the infants had been artificially fed on a liquid milk preparation, SMA. Six infants, all aged from 2 to 3 months, were studied in hospital. In 5 of them, an encephalogram recorded at the time of convulsions showed mild or diffuse abnormality. The infants all remained free from convulsion on hospital diet. The condition is attributed to lack of vitamin B₆ in the SMA preparation. Changes which had been made in the manufacture of SMA were use of palm oil in place of coconut oil and introduction of a different method of sterilisation in the can.

L. Wills.

3647

COURSIN, D. B. Convulsive seizures in infants with pyridoxine-deficient diet. *J. Amer. Med. Assoc.*, 1954, **154**, 406–408. [Dept. Paediat., St. Joseph's Hosp., Lancaster, Pa.]

Four infants were admitted to hospital with convulsive seizures which had developed when the babies were from 5 weeks to 4 months of age. The electro-encephalogram showed no clear abnormality between seizures. A change of food or sedatives prevented the fits. The case histories showed that all had been fed from birth on the liquid milk preparation SMA. A test of SMA showed that it contained only 60 μg . pyridoxine per litre, and included a vitamin preparation containing no pyridoxine. In another infant with a similar history, the electro-encephalogram during a fit was abnormal and there were occasional outbursts of a high-pitched, monotone cry; 3 min. after the intramuscular injection of 100 mg. pyridoxine there was reduced activity in the en-

cephalogram, which after 4 to 5 min. became normal. This infant subsequently remained well and developed normally on the same SMA preparation supplemented with pyridoxine. Another 50 cases subsequently came to the author's attention.

L. Wills.

3648

HUNT, A. D. (JR.), STOKES, J. (JR.), MCCRODY, W. W. and STROUD, H. H. **Pyridoxine dependency: report of a case of intractable convulsions in an infant controlled by pyridoxine.** *Pediatrics*, 1954, **13**, 140-145. [Child. Hosp., Philadelphia, Pa.] Spanish summary.

Severe convulsions occurred in an infant 3 hr. after birth and continued in spite of treatment until a vitamin preparation containing pyridoxine was given. Similar convulsions which proved fatal in 30 hr. had occurred in a previous child. During both pregnancies the mother had been treated for severe *hyperemesis gravidarum* with large doses of pyridoxine. An earlier normal pregnancy had resulted in a normal child. Clinical trial showed that 2 mg. pyridoxine daily, given orally, controlled the fits; after the withdrawal of the drug fits reappeared in about 50 hr. Electroencephalographic studies showed marked dysrhythmia and slow wave activity when a fit was developing; these abnormalities persisted but were less obvious 15 min. after pyridoxine had been given. Excretion of xanthurenic acid after administration of tryptophan showed no evidence of pyridoxine deficiency in mother or child. At 20 months, although the child had had continuous treatment, it was mentally retarded. It is suggested that the infant had an anomaly of pyridoxine metabolism and that the fits were not due to simple deficiency.—L. Wills.

3649

GONZÁLEZ MENÉNDEZ, E. La vitamina B₆ frente a la involucion senil. [Vitamin B₆ against senile decay.] *Rev. clín. española*, 1953, **51**, 112-114. [Oviedo.] English, German and French summaries.

Literature on the clinical use of vitamin B₆ in Parkinson's disease and other nervous and muscular disorders is discussed. Treatment with pyridoxine was given to 5 patients with senile tremor associated with unsteady gait, insomnia, asthenia and general impairment of faculties. A daily oral dose of 0.08 g. with intramuscular injection of 0.05 g. every second day for 24 days produced a sensation of euphoria and general well-being; tremor and unsteadiness improved within a week. The effect of vitamin B₆ in senile patients was considered to be better than that of androgens, and it is suggested that the vitamin had a direct effect on nerve centres.—A. M. Copping.

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3650

WACHSTEIN, M. and GUDAITIS, A. **Disturbance of vitamin B₆ metabolism in pregnancy. 3. Abnormal vitamin B₆ load test.** *Amer. J. Obstet. Gynecol.*, 1953, **66**, 1207-1213. [Labs., St. Catherine's Hosp., Brooklyn, N.Y.]

After an oral test dose of 25 mg. pyridoxal hydrochloride the 4-pyridoxic acid excreted in the next 8 hr. was estimated fluorimetrically. The mean excretion in mg. in the 8 hr. before the test was 0.85 ± 0.07 in 20 normal subjects and 0.74 ± 0.07 in 10 pregnant normal women. The mean amount excreted in the test by 20 normal subjects was 11.55 ± 0.25 ; in 22 patients of both sexes with a variety of diseases it was 11.15 ± 0.29 ; in 42 normal pregnant women at term and in 14 pregnant women suffering from toxæmia the mean excretion was only 8.84 ± 0.33 and 8.53 ± 0.37 mg., respectively, values significantly below the means for the normal groups. The results confirmed those of the DL-tryptophan test (Abst. 1104, Vol. 24) and are taken as a sign of vitamin B₆ deficiency in pregnancy.—L. Wills.

3651

WEIR, D. R. and MORNINGSTAR, W. A. **The effect of pyridoxine deficiency induced by desoxy-pyridoxine on acute lymphatic leukemia of adults.** *Blood, J. Hematol.*, 1954, **9**, 173-182. [Crile Vet. Admin. Hosp., Cleveland, Ohio.]

Four patients were treated while on normal hospital diet with desoxypyridoxine in divided oral doses which ranged from 600 to 1400 mg. daily. Seborrhoeic dermatitis, a sign of pyridoxine deficiency, developed with doses of 1000 mg. or more after from 16 to 18 days; no other sign occurred. In all 4 patients there was a fall in the number of immature lymphoid cells in the peripheral blood; in 1 only there was also an increase in the number of granulocytes in both blood and bone marrow, and in 2 post-mortem examination of the tissues showed some modification of the usual lymphatic infiltration. A partial temporary clinical remission was seen in 2 patients but after relapse further treatment was ineffective. All 4 patients died. Post-mortem examination of 3 showed degeneration of the adrenal cortex in all and in 2, crystalline deposits in the convoluted tubules of the kidney; there was no massive haemorrhage.—L. Wills.

3652

GRINSCHGL, G. and BLAŽEVIĆ, D. Vitamin B₆ i histamin (Izvod). [Vitamin B₆ and histamine.] *Acta med. jugoslav.*, 1953, **7**, 227-246. [Psychiat. Neurol. Klin., Univ. Graz.] In German: Serbian summary.

A subcutaneous injection of 1 ml. of 0.1 per cent. histamine phosphate was made into the arm

of 20 human subjects. Blood pressure and characteristic reactions to histamine were recorded before and after the injection. For the next 5 days an intramuscular injection of 200 mg. vitamin B₆ was given daily, and on the sixth day the same amount was injected intravenously. Thirty min. later the histamine test was repeated. In 8 of the subjects the reaction to histamine was less after administration of vitamin B₆, in 9 there was no difference, and in 3 the reaction was greater. When histamine was given in the same way but without vitamin B₆ in the intermediate period, there was no difference in the response to the first and second injections.

Daily treatment for 6 days with 200 mg. vitamin B₆ had no effect on the skin reaction to histamine in human subjects.

Of 2 groups of 20 guineapigs given an injection of 14 mg. per kg. bodyweight of histamine as the phosphate, one group was given 50 mg. vitamin B₆ for 6 days previously. Of the animals given vitamin B₆, 8 died and of those not given it 14; the signs of shock also were less in the survivors of those given vitamin B₆.—E. M. Hume.

3653

KAUFFMAN, S. L., KASAI, G. J. and KOSER, S. A. **The amounts of folic acid and vitamin B₆ in saliva.** *J. Dent. Res.*, 1953, **32**, 840-849. [Walter G. Zoller Mem. Dent. Clin., Univ. Chicago, Ill.]

Folic acid and vitamin B₆ were estimated in fresh saliva by microbiological methods with oral strains of lactobacilli as test organisms. The amount of folic acid ranged from 0.003 to 0.075, average 0.024, $\mu\text{g. per ml.}$, for 51 samples of saliva from 20 young adults. The average value for vitamin B₆ with pyridoxal hydrochloride as standard was 0.006 $\mu\text{g. per ml.}$, with a range from 0.001 to 0.017, for 52 samples from 17 subjects. The reliability of the tests is discussed and the relationship of the vitamin content of the saliva to the growth and acid production of lactobacilli in the mouth is considered.—A. M. Copping.

3654

PEÑA, E. F. **Prevention of abortion.** *Amer. J. Surg.*, 1954, **87**, 95-96. [Miami, Fla.]

Ninety multiparae with a history of from 1 to 7 miscarriages and 20 with no such history, and 90 primiparae, were given during pregnancy an oral preparation containing stilboestrol, vitamin C and the vitamin B complex, including vitamin B₁₂ and folic acid. There were only 2 abortions, both in women with a history of miscarriages. The amount given varied, large doses being used when there was a history of miscarriages or when signs of threatening abortion were present. The dose

was increased also at the periods when menstruation would have occurred. The treatment was well tolerated.—L. Wills.

3655

BŘESKÝ, J. and DVOŘÁK, L. **Příspěvek k obrazu domácí sprue.** [The picture of endemic sprue.] *Čas. Lék. čes.*, 1953, **92**, 1283-1289. [3. Intern. Clin., Karl's Univ., Prague.] Russian summary.

3656

FOUNTAIN, J. R. **The chemotherapy of acute leukaemia: a review of its present status.** *Edinb. Med. J.*, 1954, **61**, 69-83. [Dept. Med., Gen. Infirmary, Leeds.]

A lecture review with 81 references.

3657

LOWTHER, C. P. **Dangers of polypharmaceutical preparations containing folic acid.** *Brit. Med. J.*, 1954, **i**, 564-565. [Western Infirmary, Glasgow.]

A patient found to be anaemic but not fully investigated was treated with a preparation of Fe that contained folic acid, of which the daily dose provided 3 mg. There was immediate improvement in her general condition, but signs of sub-acute combined degeneration developed and in 4 months the patient was unable to stand. Treatment with anahaemin and vitamin B₁₂ produced rapid haematological and neurological improvement.—L. Wills.

3658

BARBAGALLO - SANGIORGI, G. and CAJOZZO, A. **Studio sulle modificazioni citochimiche indotte dalla somministrazione di vitamina B₁₂, a dosi elevate, sugli elementi del midollo osseo in soggetti non anemici perniciosi.** [Cytochemical changes, caused by giving large doses of vitamin B₁₂, in the bone marrow of subjects without pernicious anaemia.] 1. Comportamento degli acidi desossi e ribo-nucleinici. [1. Behaviour of ribonucleic and deoxyribonucleic acid.] 2. Comportamento dei lipidi. [2. Behaviour of fats.] 3. Comportamento dei polisaccaridi. [3. Behaviour of polysaccharides.] *Boll. Soc. ital. Biol. sper.*, 1953, **29**, 1074-1075; 1076-1078; 1078-1081. [Ist. Clin. Med., Univ. Palermo.]

1. Specimens of bone marrow from normal subjects before and after treatment were stained for ribonucleic acid by the method of Unna and Pappenheim as modified by Brachet, and for deoxyribonucleic acid by the method of Feulgen. In subjects given 50 $\mu\text{g.}$ vitamin B₁₂ daily for from 4 to 6 days, no change was seen. In other subjects

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given the same dose for from 20 to 40 days, or given 500 μ g. daily for 3 or 6 days, there was no increase of deoxyribonucleic acid, but there was increased mitotic activity, growth of nuclei and nucleoli, and increase in the ribonucleic acid content of the cytoplasm of immature red and white cells.

2. In the same subjects treated in the same way, the bone marrow preparations were stained with Sudan black B and Giemsa. In the subjects given the small dose for the short period, there was no change in the lipid staining of the marrow cells, but in a good many of the other subjects there was a decrease in lipid staining in the cytoplasm of the most immature of the granuloblast series of white cells.

3. Marrow smears from the same subjects, treated in the same way, were examined for polysaccharides by a method based on reaction with periodic acid, the exact specificity of which was, however, doubtful. In the subjects more intensively treated with vitamin B₁₂ there was a small increase in the reaction in promyelocytes, myelocytes, metamyelocytes and granulocytes. The substance responsible was possibly glycogen.

E. M. Hume.

3659

VILTER, R. W., GLAZER, H. S., MUELLER, J. F., JARROLD, T., SAKURAI, K. and WILL, J. J. The effect of vitamin B₁₂, folic acid and ascorbic acid on the nucleic acid composition of the bone marrow of patients with megaloblastic anemias. *J. Lab. Clin. Med.*, 1953, **42**, 959. *Proc.* [Cincinnati, Ohio.]

3660

REALE, V. and PUCCI, E. Sull'anemia macrocytaria nei lattanti. [Macrocytic anaemia of the infant.] *Boll. Soc. ital. Biol. sper.*, 1953, **29**, 808-810. [Clin. Pediat., Univ. Palermo.]

Studies of the red cells and bone marrow, and of the case histories, of 4 babies with macrocytic anaemia and of one normal baby led to the conclusion that the anaemia is nutritional and akin to the tropical macrocytic anaemia of Wills (Abst. 1293, Vol. 1) and the nutritional macrocytic anaemia of Spies (Abst. 903, Vol. 21).

E. M. Hume.

3661

DAS GUPTA, C. R., CHATTERJEA, J. B. and BASU, P. Vitamin B₁₂ in macrocytic anaemia in pregnancy. *Indian Med. Gaz.*, 1953, **88**, 102-105. [Dept. Haematol., Sch. Trop. Med., Calcutta.]

In 21 patients with macrocytic anaemia during pregnancy or the puerperium, 13 of them with megaloblastic marrow and 8 with normoblastic marrow, there was a poor response or none to

small oral doses of vitamin B₁₂, but in the majority there was a good initial response, associated with a suboptimum reticulocyte crisis, after parenteral treatment irrespective of the state of the marrow. The initial response was not maintained but the patients later responded to folic acid or a crude liver extract. Some of them were delivered during treatment, which made assessment of the results difficult.—L. Wills.

3662

FOY, H. and KONDI, A. The haematinic action of penicillin in megaloblastic anaemia and its relationship to B₁₂ metabolism and the intestinal flora. *Trans. Roy. Soc. Trop. Med. Hyg.*, 1954, **48**, 17-35 (with discussion 36-41). [Wellcome Trust Res. Labs.]

In extension of previous work on megaloblastic anaemia in Kenya Africans the present report deals with 24 patients, all apparently well nourished and of good physique, who were admitted with severe megaloblastic anaemia. After a period of from 4 to 10 days without treatment they were given daily for from 7 to 17 days 200,000 units of penicillin orally or 400,000 units by intramuscular injection; 8 failed to respond and of these, 4 failed to respond to 88 μ g. vitamin B₁₂ given orally but responded to the same dose given parenterally; 4 failed to respond to vitamin B₁₂ but responded to folic acid. The 4 who responded to vitamin B₁₂ given parenterally had gastric atrophy, but not the 4 who responded to folic acid. It is suggested that penicillin is not an active haematinic substance but exerts its effect in the gut.

L. Wills.

3663

STAHLIE, T. D. Megaloblasten-anaemie en vitamin B₁₂. [Megaloblastic anaemia and vitamin B₁₂.] *Maandschr. Kindergeneesk.*, 1953, **21**, 396-410. [Ermelo.] French and English summaries.

Megaloblastic anaemia was confirmed in a child aged 5½ months. It yielded at once to an intramuscular injection of 5 μ g. vitamin B₁₂. About a fortnight later improvement was ceasing and a second dose of 5 μ g. of the same preparation was given orally. Improvement recommenced and went on to complete recovery. No subsequent relapse occurred. The possible causes of the anaemia are discussed.—E. M. Hume.

3664

JÄNNES, J. Observations on the excretion of vitamin B₁₂ from the human system during efforts tests, and preliminary studies on the vitamin B₁₂ level of human blood plasma. *Proc. XXIII Scand. Congr. Int. Med.*, Oslo, 26-28 June 1952; *Acta med. scand.*, 1953, **147**, Suppl. 287, 65-66. [Helsinki.]

3665

HEINLE, R. W., BETHELL, F. H., CASTLE, W. B., LONDON, I. M. and SALTER, W. T. **Control of U.S.P. anti-anemia preparations: special report of the United States Pharmacopeia Anti-Anemia Preparations Advisory Board.** *J. Amer. Med. Assoc.*, 1953, **151**, 40-43.

A brief review is given of the earlier clinical tests of the potency of anti-anaemia preparations and of the definition of a unit of liver activity. Preparations of folic acid require to be labelled only with the amount of folic acid present. Since the isolation of vitamin B₁₂ and the development of methods of microbiological estimation, a standard microbiological method has been used to determine the vitamin B₁₂ content of refined and crude U.S.P. liver preparations, and such preparations are now labelled with their vitamin B₁₂ content in μ g. Considerable variation was found in the vitamin B₁₂ activity of products with the same activity in U.S.P. units, so that it was not possible to compute a factor for converting U.S.P. units into microgram equivalents of the vitamin. Official, parenteral preparations of refined liver extract contain 10 or 20 μ g. of vitamin B₁₂ per ml., and of crude liver extract 1 or 2 μ g. per ml. The U.S.P. unit (oral) content must be decided by clinical tests.

L. Wills.

3666

HAUSMANN, K. Über die therapeutische Bedeutung der verschiedenen Formen des Vitamin B₁₂. [Therapeutic value of the various forms of vitamin B₁₂.] *Klin. Wochenschr.*, 1953, **31**, 1017-1020. [1. Med. Abt., Allg. Krankenhaus St. Georg, Hamburg.]

A review.

3667

LOWTHER, C. P., ALEXANDER, W. D. and HENDRY, E. B. **Oral treatment of pernicious anaemia with intrinsic factor concentrate and vitamin B₁₂.** *Lancet*, 1954, **266**, 495-497. [Western Infirmary, Glasgow.]

Satisfactory remissions were maintained for 6 months in 20 patients with pernicious anaemia when their treatment was changed from parenteral vitamin B₁₂ or parenteral refined liver extract to an oral preparation, "Bifactor", which contains, per tablet, 7.5 μ g. vitamin B₁₂ and 1.5 g. of a concentrate of hog stomach. Ten of the patients took 2 tablets and ten 4 tablets daily.—L. Wills.

3668

ZIMMERMANN, H. Ein Beitrag zum Problem der peroralen Perniziosabehandlung. [Problem of oral treatment of pernicious anaemia.] *Münch. med. Wochenschr.*, 1953, **95**, 1133-1135. [2. Med. Klin., Univ. Munich.]

3669

CASTLE, W. B. **Development of knowledge concerning the gastric intrinsic factor and its relation to pernicious anemia.** *New Engl. J. Med.*, 1953, **249**, 603-614. [Dept. Med., Harvard Med. Sch., Boston, Mass.]

A review with 125 references.

3670

LATNER, A. L., MERRILLS, R. J. and RAINE, L. C. D. P. **Isolation of Castle's intrinsic factor.** *Lancet*, 1954, **266**, 497-498. [Dept. Pathol., King's Coll., Univ. Durham, Newcastle upon Tyne.]

Material obtained directly from gastric mucosa by methods to be reported later was soluble at pH 2.0. It was highly active in reducing the faecal excretion of vitamin B₁₂. It was examined by paper strip electrophoresis, with the ultracentrifuge, and analytically. With the ultracentrifuge, it was shown to contain a small amount of protein of high molecular weight which sedimented rapidly and left an apparently homogeneous material, representing about 95 per cent. of the original material; the molecular weight by the ultracentrifuge was below 20,000. By analytical methods the molecular weight was found to be of the order of 15,000. The material thus obtained and that obtained previously by electrophoresis were similar in biological activity, chemical structure and behaviour during electrophoresis; these facts and the results obtained with the ultracentrifuge are considered evidence of chemical purity.—L. Wills.

3671

CALLENDER, S. T., TURNBULL, A. and WAKISAKA, G. **Estimation of intrinsic factor of Castle by use of radioactive vitamin B₁₂.** *Brit. Med. J.*, 1954, **i**, 10-13. [Nuffield Dept. Clin. Med., Radcliffe Infirmary, Oxford.]

A standard oral dose of 0.5 μ g. of a radio-active vitamin B₁₂ preparation of high specific activity (420 μ C. per mg.) contained approximately 0.2 μ C. radio-activity. In 10 subjects haematologically normal except for one who had hypochromic anaemia, an average of 31.0 per cent. of the radio-activity of the test dose was lost in the faeces; in the presence of infection the percentage was greatly increased. In 11 patients with pernicious anaemia in remission and in 2 patients in relapse the mean loss was 88.7 per cent.; when the test was repeated with the same dose of vitamin B₁₂ but with some source of intrinsic factor added the radio-activity of the faeces was greatly reduced, the amount of the change varying with the potency of the source of intrinsic factor.

L. Wills.

N.A. and R., July 1954

3672

SCHILLING, R. F. **A new test for intrinsic factor activity.** *J. Lab. Clin. Med.*, 1953, **42**, 946-947. *Proc.* [Madison, Wis.]

3673

REISNER, E. H. and SWAN, H. T. **Effect of vitamin B₁₂ and intrinsic factor on maturation of megaloblasts in tissue culture.** *J. Lab. Clin. Med.*, 1953, **42**, 934. *Proc.* [Cleveland, Ohio.]

3674

SPIES, T. D., STONE, R. E., SUAREZ, R. M., GARCIA-LOPEZ, G., LOPEZ-TOCA, R. and REBOREDO, A. **Antianemic properties of reaction products of vitamin B₁₂ and the intrinsic factor.** *J. Amer. Med. Assoc.*, 1953, **151**, 1264-1266. [Dept. Nutrit., Northwestern Univ. Med. Sch., Chicago, Ill.]

Eight patients with pernicious anaemia in relapse, 2 with tropical sprue and macrocytic anaemia, and 1 with nutritional macrocytic anaemia, the last three with free HCl in their gastric juice, were treated orally for from 10 to 15 days with from 10 to 15 μ g. crystalline vitamin B₁₂ daily; none responded clinically or haematologically. The vitamin B₁₂ preparation was then replaced by one containing the same daily dose of the vitamin, together with a source of intrinsic factor. All the patients responded both clinically and haematologically, but the response by those with sprue and nutritional macrocytic anaemia was not as full as by the patients with pernicious anaemia. Three patients known to respond poorly to vitamin B₁₂, given orally either alone or after incubation with normal gastric juice, did not respond to the dose of the combined preparation used in the previous trial, though they responded fully to 10 μ g. of the vitamin by intramuscular injection. Another study of 11 patients with sprue and anaemia confirmed that they were more resistant than patients with pernicious anaemia to combined preparations given orally. The combined preparation used was active after boiling for 30 min.—L. Wills.

3675

SCHILLING, R. F. **Intrinsic factor studies. 2. The effect of gastric juice on the urinary excretion of radioactivity after the oral administration of radioactive vitamin B₁₂.** *J. Lab. Clin. Med.*, 1953, **42**, 860-866. [Dept. Med., Med. Sch., Univ. Wisconsin, Madison.]

In normal subjects an appreciable amount of radio-activity appeared in the urine after an oral dose of 2 μ g. vitamin B₁₂ ⁶⁰Co followed 2 hr. later by 1000 μ g. of non-radio-active vitamin B₁₂ given subcutaneously; in patients with pernicious

anaemia in remission only traces of radio-activity were detected after such treatment, but administration of normal gastric juice with the labelled vitamin produced an excretion of the same order as that in normal subjects. Boiling the gastric juice before use prevented the appearance of activity in the urine. The administration of terramycin did not increase the radio-activity of urine after the test doses in a patient with pernicious anaemia. No radio-activity could be detected in the urine when the subcutaneous "flushing" dose of non-active vitamin B₁₂ was omitted. The author considered that his results supported the view that the intrinsic factor promotes the absorption of vitamin B₁₂ in patients with pernicious anaemia.—L. Wills.

3676

RUBIN, C. E. and MASSEY, B. W. **The stomach in treated pernicious anemia: a cytologic study.** *J. Lab. Clin. Med.*, 1953, **42**, 942. *Proc.* [Chicago, Ill.]

3677

ISRAËLS, M. C. G. and SHUBERT, S. **The treatment of pernicious anaemia by insufflation of vitamin B₁₂.** *Lancet*, 1954, **266**, 341-343. [Dept. Haematol., Univ. Manchester.]

Four patients with untreated pernicious anaemia and one patient with pernicious anaemia in remission were successfully treated with vitamin B₁₂ snuff which was blown into the nose and inhaled. The dose used was 100 μ g. from one to three times daily at first and twice weekly for maintenance; such doses were well tolerated locally. The expense of such treatment compares very favourably with that of oral treatment with tablets containing vitamin B₁₂ and intrinsic factor.

L. Wills.

3678

MONTO, R. W. and REBUCK, J. W. **Nasal instillation and inhalation of crystalline B₁₂ in the treatment of pernicious anemia.** *J. Lab. Clin. Med.*, 1953, **42**, 925-926. *Proc.* [Detroit, Mich.]

3679

BASTRUP-MADSEN, P. **Non-anaemic neuropathy caused by deficiency of the anti-pernicious-anaemia principle following subtotal gastrectomy.** *Acta med. scand.*, 1953, **147**, 399-404. [Dept. Med., Marselisborg Hosp., Aarhus.]

Nerve signs developed in 2 patients who had undergone subtotal gastrectomy. In one, signs of peripheral neuritis appeared 2 months after the operation, and 12 months later the posterior columns of the cord were seriously affected, but in the other, 13 years elapsed before signs appeared,

and then they were only those of peripheral neuritis. The blood and bone marrow findings were normal in both patients. Parenteral treatment with vitamin B₁₂ resulted in complete cure.

L. Wills.

3680

BASTRUP-MADSEN, P. The cytology of the bone marrow in pernicious anaemia with normal haemoglobin level. Glossitis and subacute combined degeneration of the spinal cord due to deficiency of the anti-pernicious-anaemia principle. *Acta med. scand.*, 1954, **148**, 13-26. [Dept. Med., Marselisborg Hosp., Aarhus.]

Blood and bone marrow were examined and gastric juice was analysed from 7 patients with chronic glossitis and signs of subacute combined degeneration of the cord and from 1 patient with nerve signs only. In all, the Hb value was normal, but the red cell count was slightly low in most, so that the colour index was high, a finding suggestive of pernicious anaemia. Further evidence in support of the diagnosis was the presence of abnormal giant neutrophils in the bone marrow of every patient and of intermediate megaloblasts in the bone marrow of some. Every patient had histamine-fast achlorhydria. After treatment with liver extract or vitamin B₁₂ the glossitis and the neurological signs improved or disappeared, and the blood and marrow became normal. It is concluded that for diagnosis of such latent pernicious anaemia, examination of the bone marrow is essential.—L. Wills.

3681

WILL, J. J., MUELLER, J. F., GLAZER, H. S., FRIEDMAN, B. I. and VILTER, R. W. The alteration of ascorbic acid oxidation in pernicious anemia. *J. Lab. Clin. Med.*, 1953, **42**, 967. *Proc.* [Cincinnati, Ohio.]

3682

PITNEY, W. R. and BEARD, M. F. Serum vitamin B₁₂ concentrations in pernicious anemia. *J. Lab. Clin. Med.*, 1953, **42**, 928-929. *Proc.* [Louisville, Ky.]

3683

BONSDORFF, B. v. Pathogenesis of pernicious anaemia, caused by the fish tapeworm. *Proc. XXIII Scand. Congr. Int. Med., Oslo*, 26-28 June 1952; *Acta med. scand.*, 1953, **147**, Suppl. 287, 63 (with discussion 63-64). [Helsinki.]

See Abst. 5112, Vol. 23.

3684

KAIPAINEN, W. J. and TÖTTERMAN, G. On the B₁₂ vitamin content in faeces in pernicious

tape-worm anaemia. *Proc. XXIII Scand. Congr. Int. Med., Oslo*, 26-28 June 1952; *Acta med. scand.*, 1953, **147**, Suppl. 287, 66-67 (with discussion 67-68). [Helsinki.]

3685

OLIVER-PASCUAL, E., OLIVER-PASCUAL, A., ELOSEGUI, C. and ALVAREZ, E. Formas hemolíticas de la anemia mediterránea. Análisis de dos casos complicados con deficiencia de vitamina B₁₂. [Haemolytic forms of Mediterranean anaemia. Analysis of two cases complicated by vitamin B₁₂ deficiency.] *Rev. española Enferm. Apar. digest. Nutricion*, 1954, **13**, 14-26. [Clin. Med. Int., Hosp. Provincial.] English summary.

Full clinical details are given for 2 patients with haemolytic anaemia of the Mediterranean type complicated by achlorhydria and megablastic anaemia of the type associated with lack of vitamin B₁₂. Treatment with liver extracts and vitamin B₁₂ did not restore the blood picture to normal until splenectomy relieved the characteristic splenic enlargement.—A. M. Copping.

3686

SURTEES, S. J. and HUGHES, R. R. Treatment of trigeminal neuralgia with vitamin B₁₂. *Lancet*, 1954, **266**, 439-441. [Royal Southern Hosp., Liverpool.]

Treatment with massive intramuscular doses of vitamin B₁₂ was given to 18 patients with trigeminal neuralgia and to 1 with glossopharyngeal neuralgia; in 15 of the former and in the latter there was symptomatic improvement, generally sudden in onset, which varied from complete relief to definite improvement. A generally suitable course of treatment was 1 mg. daily for 10 days followed by 5 injections of the same dose twice a week. Relapses occurred but the patients responded to further courses of treatment.

L. Wills.

3687

VERGA, G. La vitamina B₁₂ nella terapia di alcune sindromi dolorose. Ipotesi sul meccanismo d'azione. [Vitamin B₁₂ in the treatment of some painful syndromes. Hypothesis of the mechanism of action.] *Acta vitaminol.*, 1954, **8**, 11-24. [Reperto Biol., Lab. Ricerche, Lepetit S.P.A., Milan.] French, English, German and Spanish summaries.

The article is a theoretical discussion of the way in which vitamin B₁₂ abolishes pain in certain human diseases.—E. M. Hume.

3688

SAUER, H. and DÜSSLER, A. Die Behandlung der diabetischen Polyneuritis mit Vitamin B₁₂—

N.A. and R., July 1954

[Treatment of diabetic polyneuritis with vitamin B₁₂.] *Klin. Wochenschr.*, 1953, **31**, 960-961. [I. Med. Klin., Univ. Hamburg, Eppendorf.]

In 18 patients with diabetic polyneuritis of varying duration, a daily dose of 60 µg. vitamin B₁₂ for 10 days produced no improvement, but when the dose was increased to 1000 µg. daily most of the patients improved and, after 2 or 3 days, had less pain and paraesthesia. Later there was improvement in the hyperaesthesia, hyperalgesia and burning of the soles of the feet; often the cramp in the calves improved also. There was no improvement in the abnormal reflexes or in the signs related to the vegetative nervous system, possibly owing to the shortness of the observation period.

L. Wills.

3689

BERGLUND, H. and PAUL, K. G. **Two cases of porphyria cutanea tarda, treated with vitamin B₁₂**. *Proc. XXIII Scand. Congr. Int. Med.*, Oslo, 26-28 June 1952; *Acta med. scand.*, 1953, **147**, Suppl. 287, 91 (with discussion 92).

See also Abst. 3795.

Vitamin C

3690

DUDLEY, S. **James Lind : laudatory address**. *Proc. Nutrit. Soc.*, 1953, **12**, 202-209.

3691

Lind bicentenary symposium. **A conference on scurvy and vitamin C in honour of James Lind, M.D., F.R.C.P.E., whose Treatise of the Scurvy was published in Edinburgh, A.D. 1753**. *Proc. Nutrition Soc.*, 1953, **12**, 202-344.

3692

INGLEBY-MACKENZIE, A. **Chairman's opening address : James Lind**. *Proc. Nutrition Soc.*, 1953, **12**, 233-237. [Med. Dept. Royal Navy, Queen Anne's Mansions, St. James's Park, London, S.W.1.]

3693

LORENZ, A. J. **Some pre-Lind writers on scurvy**. *Proc. Nutrition Soc.*, 1953, **12**, 306-324. [Sunkist Growers, Los Angeles 54, Calif.]

3694

CHICK, H. **Early investigations of scurvy and the antiscorbutic vitamin**. *Proc. Nutrition Soc.*, 1953, **12**, 210-219. [Lister Inst. Prevent. Med., London, S.W.1.]

3695

VITAMIN C SUBCOMMITTEE OF THE ACCESSORY FOOD FACTORS COMMITTEE, MEDICAL RE-

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SEARCH COUNCIL, AND OTHERS. **Vitamin C requirement of human adults**. *Med. Res. Council. Spec. Rep. Ser. No. 280*, 1953, pp. viii + 179 + 24 plates. Price 17s. 6d. net. H.M.S.O., London.

The Report is the full account of the study briefly reported earlier (Abst. 2449, Vol. 18). A short historical account is given of other experiments on vitamin C deprivation in man. There is a full account of the main experiment. Fifteen special aspects of the experiment are elaborated separately; they include results of saturation tests, exercise-tolerance tests, capillaroscopy, and haematological investigation. Details of methods are given in full, and there are case histories of all the 20 volunteers. Tables give for each subject all the individual results of estimations of vitamin C in plasma, whole blood and white cells, of blood urea, proteins and phosphatase, and of vitamin C in the urine. There are long series for vitamin C content of the same material by several different methods. Other data which were too voluminous for publication can be obtained as microfilms. There are 6 coloured plates of scorbutic lesions, and 18 uncoloured ones.—E. M. Hume.

3696

KREBS, H. A. **The Sheffield experiment on the vitamin C requirement of human adults**. *Proc. Nutrition Soc.*, 1953, **12**, 237-246. [Med. Res. Council. Unit Res. Cell Metabol., Dept. Biochem., Univ. Sheffield.]

3697

CRANDON, J. H., MIKAL, S. and LANDEAU, B. R. **Ascorbic-acid deficiency in experimental and surgical subjects**. *Proc. Nutrition Soc.*, 1953, **12**, 273-279. [Boston City Hosp., Mass.]

3698

KARK, R. M. **Ascorbic acid in relation to cold, scurvy, ACTH and surgery**. *Proc. Nutrition Soc.*, 1953, **12**, 279-293. [Dept. Med., Univ. Illinois Coll. Med., Chicago.]

3699

SIGURJONSSON, J. **Vergleich zwischen den Plasmawerten und dem Ausfall der Sättigungsprobe bei verschiedener Grössenordnung der Vitamin-C-Einnahme. [Comparison between plasma values and the results of saturation tests at different levels of vitamin C intake]**. *Internat. Ztschr. Vitaminforsch.*, 1954, **25**, 186-193. [Abt. Hyg., Univ. Reykjavik.] English and French summaries.

The mean blood plasma ascorbic acid value of pupils in a boarding school was 0.57 mg. per 100

ml. in October, 0.31 in February, 0.16 in May and 0.11 in June. The average dietary intake was from 40 to 50 mg. in autumn, 35 to 30 mg. in winter and 20 to 23 in spring. Loading tests with 10 mg. ascorbic acid per kg. bodyweight daily showed that saturation was reached after 2 days in the autumn but required several days at other times. It is concluded that the plasma ascorbic acid value is a better index of dietary intake than the results of saturation tests.—W. Godden.

3700

NEWHALL, C. A., MERROW, S. B., DURBROW, A. B., LAMDEN, M. P. and PIERCE, H. B. **On physical stigmata ascribed to vitamin A and ascorbic acid deficiencies.**

MERROW, S. B., LAMDEN, M. P., PIERCE, H. B., NEWHALL, C. A., CHRYSTOWSKI, G. A. and DURBROW, A. B. **Relationships between physical signs of deficiency, blood levels, and food intakes with respect to vitamin A and ascorbic acid in selected groups of children.** *J. Clin. Nutr.*, 1953, 1, 517-527; 528-533. [Dept. Biochem., Coll. Med., Univ. Vermont.] Spanish summaries.

Schoolchildren under 12 years of age were examined for physical signs of deficiency of vitamins A and C. Three groups, each of 25 children, were selected according to certain criteria as deficient in vitamin A, deficient in vitamin C, or normal. The signs of vitamin A deficiency were taken as thickening of the bulbar conjunctiva, follicular hyperkeratosis, and dryness, crinkling and scaling of the skin. The signs of vitamin C deficiency were taken as abnormalities of the gums, skin, eyes, tongue and lips, and in resistance to bleeding. Statistical studies were made on the rate of incidence of these abnormalities in each group, and of the frequency with which pairs or groups of abnormalities occurred together. On using incidence only of the signs, a majority of the normal group could have been included in a deficient group since they had one or more of the signs associated with vitamin A or vitamin C deficiency. When degree of severity was noted as well as incidence, group differences became apparent and the use of combinations of signs together with incidence and severity defined the 3 groups.

Vitamin A, carotene and ascorbic acid were estimated chemically in the autumn of 1949 and the spring of 1950, in the blood of children divided, as described above, into a normal group, and groups showing signs of deficiency of vitamins A and C. Only small differences were found in vitamin A values between the vitamin-A-deficient and the normal group, and in ascorbic acid values between the vitamin-C-deficient and the normal group. A greater disparity was found between

the carotene values in the vitamin-A-deficient and the normal groups, the respective values, in $\mu\text{g.}$ per 100 ml., being 127 and 161 in the autumn, and 137 and 186 in the spring. The relationships between the values for vitamins A and C and carotene in the blood and the records of dietary intakes were suggestive but irregular.—T. Moore.

3701

GOUNELLE, H. and TEULON, H. **Contribution à l'étude de la vitamine C dans certains états physiologiques et pathologiques chez l'homme. [Study of vitamin C in certain physiological and pathological states in man.]** *Proc. Nutrition Soc.*, 1953, 12, 325-329. [Centre Recherches Foch, 4 Avenue de l'Observatoire, Paris.]

3702

CATEL, W., SCHUPHAN, W., BARTH, L., KATHEN, H. and WEINMANN, I. **Tier- und humanphysiologische Untersuchungen über die Vitamin C-Wirksamkeit von Apfelsorten verschiedener Ascorbinsäuregehalte. [Physiological studies in animals and man on the vitamin C activity of varieties of apple with different ascorbic acid contents.]** *Biochem. Ztschr.*, 1954, 325, 109-122. [Landeskinderheilstätte Mammols Höhe, Taunus.]

Wide differences occur with variety in the ascorbic acid content of fruit and vegetables, particularly of apples. To test whether such differences are reflected in the biological activity of the fruits, feeding experiments were made with groups of guineapigs on a diet low in vitamin C to which differing amounts of 2 varieties of apples, one containing 20.6 and the other 3.1 mg. ascorbic acid per 100 g., were added. With 10 g. daily of the second there was no protection from scurvy, but with 2 g. of the first protection was complete.

In an experiment with 39 children aged from 4 to 16 years, recovering from tubercular disease, the blood vitamin C value before the beginning of the experiment was near the level in scurvy although the children had been on a diet containing adequate fruit and vegetables. The relative response in blood and urine of the children to supplements of the 2 varieties of apples given for 3 weeks reflected the result obtained in the animal experiment. In human diets, therefore, attention should be paid to quality rather than quantity of fruits and vegetables, and in hospitals, sanatoria, children's homes and community feeding centres there should be control by chemical analysis.

W. Godden.

3703

CATEL, W. and SCHUPHAN, W. **Über den verschiedenen Gehalt einzelner Apfelsorten an Vitamin C und seine Bedeutung für die Ernährung**

N.A. and R., July 1954

(Untersuchungen an tuberkulosekranken Kindern). [The different vitamin C contents of individual varieties of apple and their importance for nutrition. Investigations on tuberculous children.] *Monatsschr. Kinderheilk.*, 1953, **101**, 473-477. [Landeskinderheilstätte Mammols Höhe, Taunus.]

See preceding Abst.

3704

STEWART, C. P., HORN, D. B. and ROBSON, J. S. **Dehydroascorbic acid in human blood plasma.** *Proc. Nutrition Soc.*, 1953, **12**, 300-305. [Clin. Lab., Royal Infirmary, Edinburgh.]

3705

LUGG, J. W. H. and ELLIS, F. P. **Some water-soluble vitamins in the sweat of tropically acclimatized European men.** *Brit. J. Nutrition*, 1954, **8**, 71-77. [Dept. Biochem., Univ. Malaya, Singapore.]

Healthy European men aged from 20 to 40 years who had lived in a warm, moist, tropical climate for $1\frac{1}{2}$ to $4\frac{1}{2}$ years did work in a climate considerably warmer than the normal Singapore climate. The arms were encased and sweat was collected for from 20 to 40 min. The subjects drank freely during and after the exercise and in some cases took 4 doses of 125 mg. L-ascorbic acid at regular intervals during the 26 hr. beforehand. Ascorbic acid and dehydroascorbic acid were estimated in sweat and urine, and vitamin B₁ in sweat. Ascorbic acid was estimated by Lugg's method (Abst. 260, Vol. 13), vitamin B₁ by that of Friedemann and Kmiecik (Abst. 2536, Vol. 13).

The concentration of ascorbic acid and dehydroascorbic acid together did not exceed 0.05 mg. per 100 ml. sweat and was generally less or negligible; no serious loss could thus occur even in 10 litres of sweat daily if the intake were normal, but subjects with a low intake could become depleted over a period of time. In more precise estimations the average content in mg. per 100 ml. was for ascorbic acid 0 and for dehydroascorbic acid 0.02. The results differ somewhat from those obtained by other workers (Kirch *et al.*, *Proc. Soc. Exp. Biol. Med.*, 1943, **54**, 307; Shields *et al.*, Abst. 3647, Vol. 15) and the reasons for discrepancy are discussed. The administration of 500 mg. L-ascorbic acid before exercise had no significant effect.

Administration of ascorbic acid increased the urinary output about 7 times but the output of dehydroascorbic acid did not appear to be significantly affected. Since dehydroascorbic acid was converted spontaneously to diketogulonic acid, especially in urine of high pH value, the urinary loss may have been appreciably greater.

Excretion of vitamin B₁ in sweat was 0.123 mg. per 100 ml.—V. R. Jackson.

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3706

DUSTIN, J. P. and BIGWOOD, E. J. **Aminoaciduria in infancy and ascorbic-acid deficiency.** *Proc. Nutrition Soc.*, 1953, **12**, 293-300. [Dept. Biochem., Fac. Med., Univ. Brussels.]

3707

LAMDEN, M. P. and CHRYSTOWSKI, G. A. **Urinary oxalate excretion by man following ascorbic acid ingestion.** *Proc. Soc. Exp. Biol. Med.*, 1954, **85**, 190-192. [Dept. Biochem., Coll. Med., Univ. Vermont, Burlington.]

The mean 24-hr. urinary excretion of oxalic acid by 51 healthy men on a normal diet was 38.3 ± 1.7 mg., the value for any one individual being remarkably constant over a 3-week period. The men were divided into groups, some of which received daily for one week 0.25, 0.5, 1, 2, 4 or 8 g. ascorbic acid given in 3 portions. The ingestion of less than 4 g. ascorbic acid daily had no significant effect on oxalic acid excretion during the succeeding 24 hr.; 4 g. caused an increase of 12 mg., 8 g. an increase of 45 mg. and 9 g., given for only 2 days, an increase of 68 mg.—W. Godden.

3708

KLEIN, R., PAPADATOS, C. and FORTUNATO, J. **Effect of ascorbic acid on hormonal excretion.** *J. Clin. Endocrinol.*, 1954, **14**, 105-106. [Dept. Paediat., Child. Hosp., Pittsburgh, Pa.]

No significant change was found in the urinary excretion of 17-ketosteroids and 17:21-dihydroxy-20-ketosteroids, when from 1.5 to 5.0 g. ascorbic acid was given daily to 4 normal adults and 4 children. There was in all a sharp decrease in the excretion of "blue chromogens", substances giving the Allen blue colour reaction, which returned to normal after 4 days.—W. Godden.

3709

McSWINEY, R. R., CLAYTON, B. E. and PRUNTY, F. T. G. **Ascorbic-acid metabolism after administration of corticotrophin.** *Lancet*, 1954, **266**, 178-182. [Dept. Chem. Pathol., St. Thomas's Hosp., London.]

Injection of adrenocorticotrophic hormone into patients with initial plasma ascorbic acid values above 0.75 mg. per 100 ml. raised the urinary output of ascorbic acid estimated by the method of Roe and Kuether (Abst. 261, Vol. 13), usually for 2 or 3 days, with evidence of an increase in the amount but not in the proportion of immediate oxidation products. In patients with initial plasma ascorbic acid values below 0.6 mg. per 100 ml. injection of the hormone did not produce these changes. In patients not given the hormone, increase of the ascorbic acid intake raised the excretion of ascorbic acid and its oxidation products in proportions similar to those after the injection.

of adrenocorticotrophic hormone in the first subjects. In guineapigs adequately supplied with ascorbic acid injection of adrenocorticotrophic hormone produced effects similar to those obtained with human subjects with high plasma ascorbic acid values.—W. Godden.

3710

SCHOENBERGER, J. A. **The effect of ACTH on the metabolism and excretion of ascorbic acid.** *J. Lab. Clin. Med.*, 1953, **42**, 948. *Proc.* [Chicago, Ill.]

3711

JANDL, J. H. and GABUZDA, G. J. (Jr.) **Potentiation of pteroylglutamic acid by ascorbic acid in anemia of scurvy.** *Proc. Soc. Exp. Biol. Med.*, 1953, **84**, 452-455. [Thorndike Mem. Lab., Second and Fourth Med. Serv., Boston City Hosp., Mass.]

Anaemia associated with scurvy in 2 malnourished men responded to daily intramuscular administration of 125 and 250 μ g. pteroylglutamic acid. When ascorbic acid was given after 10 and 12 days, respectively, a second reticulocyte peak was recorded, the red cell count rose rapidly, and all signs of scurvy disappeared. The first patient excreted no measurable amount of citrovorum factor in the urine, but the second excreted small amounts throughout the period of observation, and increasing amounts of folic acid while pteroylglutamic acid was being given.—A. M. Copping.

3712

FAESSLER, V. **Ergebnisse der Keuchhustenbehandlung mit Vitamin C (Cebion) und Vitamin K (Karanum).** [Treatment of whooping-cough with vitamin C (Cebion) and vitamin K (Karanum).] *Münch. med. Wochenschr.*, 1953, **95**, 1230-1231. [Baisieperstr. 14a, Remscheid, Rheinland.]

Children with whooping-cough were given daily for 6 days intramuscular injections of 10 mg. vitamin K and 250 mg. vitamin C; 4 patients in the catarrhal stage recovered without developing a convulsive cough but, of 15 patients in whom the cough had already reached the stage of whooping, a curative effect was seen only in the 10 treated during the first week of that stage. In 3 contacts, 4 prophylactic injections prevented the occurrence of whooping. The results confirm those reported in the Spanish and South American literature.

L. Wills.

See also Abst. 3602.

Vitamin D

3713

HELLBRÜGGE, T. F. **Die Rachitisprophylaxe durch Vigantolverabreichung in der Neugeborenenperiode und durch Vitamin-D-Zusatz in der**

Säuglingsnahrung. [Prevention of rickets in the newborn with Vigantol and in the infant with addition of vitamin D to the food.] *Münch. med. Wochenschr.*, 1953, **95**, 1323-1327. [Kinderpoliklin., Univ. Munich.]

Florid rickets is almost a thing of the past in Germany, but a mild form is very widespread, which is attributed to the postponement of treatment with vitamin D until the third month of life or later. From 1949 onwards, therefore, newborn infants were given 10 mg. vitamin D₂ on leaving all the lying-in clinics in Munich except 2. In 1952 a survey of babies between 3 and 5 months old given vitamin D was made, comparable with one made in 1948 before treatment of the newborn with vitamin D was begun. The percentage of infants in 1948 and 1952, respectively, was without rickets 18.8 and 25.1, with slight rickets 19.2 and 35.4, with less slight rickets 33.2 and 26.5, with moderately severe rickets 20 and 12, and with severe rickets of 8.8 and 1. Figures in 1952 for babies not given vitamin D from birth did not show any such improvement.

Use of cow's milk, or a milk and cereal infant food, fortified with vitamin D also gave good results.

The results obtained in Munich were, however, never as good as those obtained in Frankfurt where the whole milk supply is irradiated with ultraviolet light. Fortification in one way or another of the whole milk supply with vitamin D is considered to be the most effective method of prophylaxis.—E. M. Hume.

3714

PRENZEL, H. and SIMON, H. A. **Rachitis und vitaminisierte Milch.** [Rickets and vitamin-enriched milk.] *Monatsschr. Kinderheilk.*, 1953, **101**, 397-402. [Elisabeth-Kinderkrankenhaus, Oldenburg.]

The incidence of rickets is still disturbingly high in Germany so, in February and March 1950, a survey was undertaken of all the infants born in Oldenburg between 1 February and 31 December 1949. Craniotabes was the only criterion of which 3 grades were distinguished; only in the lightest grade were there usually no other signs. Of 551 children aged from 8 to 13 months, 45 had rickets of the lightest grade and 7 had rickets of the second or third grade; 456 had had vitamin D as Vigantol. Of 416 babies aged from 2 to 7 months, 163 had rickets of the lightest grade and 96 of the second or third grade; 215 had had Vigantol. When the results were compared with those in other towns, the incidence in Oldenburg was near to that in Cologne, but in both it was only about half that in Bremen or Munich. When the results were analysed according to whether the children had had Vigantol or not, the percentage of those with

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rickets, given Vigantol, was in Oldenburg about half that of those not given Vigantol, but in Bremen and Munich the difference was small. The difficulties of prophylaxis are discussed, and it was decided to make an experiment whereby the milk supply of Oldenburg, at no further cost to the customer, was enriched with 1000 "units" of vitamin D₃ per litre, from September 1950. Infants of from 2 to 7 months were examined as before in 1950-51, and the percentage with rickets of the two more severe grades was without Vigantol or enriched milk 20, with Vigantol and without enriched milk 18.3, and with enriched milk and without Vigantol 5.7. The results compared well with those obtained in Frankfurt, where the milk supply is irradiated with ultraviolet light. Such a method of inescapable prophylaxis is preferred. The rather high figure of 1000 "units" vitamin D per litre was chosen to extend protection to infants partly breast fed.—E. M. Hume.

3715

KLINKE, K., BOGNER, W. and GLEISS, J. Zur Dosierung des Vigantol D₃ bei Frühgeborenen. [Dosage of vitamin D₃ for premature infants.] *Deutsch. med. Wochenschr.*, 1954, **79**, 370-371. [Kinderklin., Med. Akad., Düsseldorf.]

On the assumption that vitamin D₃ is more satisfactory for treating babies than vitamin D₂, a change was made from the latter to the former, in the same dosage, in a children's clinic in Nürnberg and another in Düsseldorf, with the result that 2 premature babies in each clinic became very ill. Two of the babies had received 15 mg. vitamin D₃ at the age of 6 weeks, and 2 received 10 mg. three times in the first 9 weeks of life. The intoxication from vitamin D excess was severe, and one of each pair died. The dosage of vitamin D₃ subsequently recommended for premature infants was in Nürnberg 5 mg. given orally, and in Düsseldorf from 60,000 to 120,000 I.U. in oil solution by intramuscular injection at the age of 2 weeks, to be repeated after 4 weeks if necessary.

E. M. Hume.

3716

YAMANOUCHI, T. and MITANI, M. [Studies on rickets. Concerning the serum alkaline phosphatase of rachitic and healthy children. 1.] *Sapporo Med. J.*, 1952, **3**, 61-66. [Dept. Paediat., Sapporo Univ. Med.] In Japanese: English summary.

In the blood serum of rachitic children, values for alkaline phosphatase were high and for inorganic P variable. For diagnosis it is recommended that both should be estimated. After treatment of rickets with a single dose of 15 mg. vitamin D₂, the phosphatase value fell in most of the children, and the inorganic P value rose. Both were higher in healthy children than in healthy adults. There

was no difference between the values for breast-fed and artificially fed infants. (From summary.) E. M. Hume.

3717

LAHA, P. N., CHAKRAVARTI, M. G. and SINGH, R. Serum calcium and phosphorus, 24 hours after massive calciferol therapy. *Indian Med. Gaz.*, 1953, **88**, 508-509. [Dept. Med., Med. Coll., Agra.]

In 6 of 10 men, 24 hr. after intramuscular injection of 15 mg. calciferol, serum Ca was significantly reduced and serum inorganic P was significantly raised; one showed a marked fall in serum P. Other changes were not significant.—F. C. Aitken.

3718

PINCUS, J. B., GITTLEMAN, I. F., SOBEL, A. E. and SCHMERZLER, E. Effects of vitamin D on the serum calcium and phosphorus levels in infants during the first week of life. *Pediatrics*, 1954, **13**, 178-185. [Dept. Paediat., Jewish Hosp., Brooklyn, N.Y.] Spanish summary.

Ca and P were estimated in the blood serum of 5 groups of from 13 to 52 infants on the first day of life and 5 days later. Two groups were given breast milk, one with a daily supplement of 600 U.S.P.U. vitamin D and one without. Three groups received a powdered milk preparation, one without added vitamin D, one with vitamin D incorporated in the milk powder to yield 400 U.S.P.U. per 1000 ml., and one with a separate supplement of 600 U.S.P.U. daily.

In the breast-fed infants there was no significant difference between the mean values on the first and fifth day, though in those given vitamin D the mean value for Ca was lower, and that for P was higher, than on the first day.

In the 3 groups given milk powder, the mean values for P were significantly higher on the fifth day than on the first, but the 3 values did not differ significantly from one another. In all 3 groups the mean value for serum Ca was lower on the fifth day than on the first. The difference was small in the group not given vitamin D, and was larger in the groups given vitamin D, being largest in that given the largest amount, where the difference from the values in the other 2 groups given milk powder was statistically significant. The larger the intake of vitamin D in the groups having milk powder, the larger was the proportion of children with serum Ca values below 8 mg. per 100 ml. The reason why administration of vitamin D should tend to depress the serum Ca value is discussed.—E. M. Hume.

3719

DE VRIES, J. A. and HUISMAN, T. H. J. Het effect van een mengsel van natriumcitraat en

citroenzuur bij een geval van floride rachitis. [**Effect of sodium citrate and citric acid in a case of florid rickets.**] *Maandschr. Kinder-geneesk.*, 1953, **21**, 380-386. [Kinderklin., Rijks. Univ., Groningen.] French and English summaries.

A child of 9 months with florid rickets was given daily for 21 days 9.6 g. citric acid as the acid or as Na citrate. The P content of the blood rose from 3.7 mg. per cent. to 4.2, but radiographically there was no sign of healing. When, however, a single oral dose of 300,000 "units" of vitamin D₃ was given, healing was apparent within 20 days. It is suggested that the dose of citrate was too large.—E. M. Hume.

3720

DE WET, I. S. Vitamine-D resistente ragitis. [**Vitamin-D-resistant rickets.**] *S. African Med. J.*, 1954, **28**, 121-126. [Dept. Orthopaed., Pretoria.]

A short review precedes a full account of 2 cases, a girl of 15 and a girl of 5.—E. M. Hume.

3721

COLEMAN, E. N. and FOOTE, J. B. **Craniostenosis with familial vitamin-D-resistant rickets.** *Brit. Med. J.*, 1954, **i**, 561-562. [City Hosp., Nottingham.]

The case of a boy aged 6 years is reported because of the rarity of scaphocephaly, caused by premature closure of the sagittal suture, in association with vitamin-D-resistant rickets. The rickets was of the type with very low values for plasma P. E. M. Hume.

3722

VAN CREVELD, S. and ARONS, P. Nadare ervarigen bij een bijzonder geval van renale osteoporosis met aminoacidurie, behandeld met dihydrotachysterol. [**A peculiar case of renal osteoporosis with amino-aciduria, treated with dihydrotachysterol.**] *Maandschr. Kinder-geneesk.*, 1953, **21**, 294-300. [Kinderklin., Univ. Amsterdam.] French and English summaries.

For a previous report on the same case, see Abst. 5450, Vol. 19; Title 2707, Vol. 20.

In 1949, early in its second year, the child had severe rickets which did not yield to vitamin D₂, 300,000 "units". The failure was at first attributed to excess of vitamin D, but later, treatment with dihydrotachysterol proved successful, and values for serum Ca and P rose and for alkaline phosphatase fell. Attempts to combat rickets with cod liver oil were completely unsuccessful; the blood values deteriorated and amino-aciduria was present. Recourse to dihydrotachysterol and Ca gluconate was again successful, and the child

has been satisfactorily maintained by that means to the age of 6. The lesion is thought to be one in the kidney tubules.—E. M. Hume.

3723

HOLT, J. F., LATOURETTE, H. B. and WATSON, E. H. **Physiological bowing of the legs in young children.** *J. Amer. Med. Assoc.*, 1954, **154**, 390-394. [Dept. Radiol., Univ. Michigan, Ann Arbor.]

All children with bow legs have not had rickets. Case histories are given for 5 bow-legged children, 3 of them from one family, originally studied at ages of from 6 to 18 months, and representative of 14 at first believed to have rickets or Blount's *osteochondrosis deformans tibiae*. Health and growth were otherwise normal and all but one of the 5 had had regular vitamin supplements from an early age. X-ray photographs showed flaring of the femoral and tibial metaphyses, wedging of the distal femoral epiphyses and other changes, interpreted as structural changes secondary to the bowing, but no sign of rickets at the epiphyseal-metaphyseal junctions. By the time the children had reached ages of from 3 to 5 years the bowing had spontaneously regressed and in some completely disappeared. X-ray examination to rule out rickets is considered essential, but the results must be interpreted with caution.—W. M. Deans.

3724

THOMASCHECK, G. Über die Verhinderung des medikamentös bedingten Haarausfalles durch Vitamin D₂ in Milch-Eiweissbindung. [**Prevention by vitamin D₂ in combination with milk protein of hair loss caused by drugs.**] *Deutsch. med. Wochenschr.*, 1954, **79**, 41-45. [Städt. Frauenklin., Berlin-Neukölln.]

It was noticed that treatment with heparin, even in the smallest effective dose, caused loss of hair, usually from the head, and sometimes total. After a couple of weeks new growth began.

Seven weeks after the beginning of treatment with heparin, 214 women patients were given for 14 days 2 or 3 daily doses of vitamin D₂ in combination with milk protein (Chemische Werke Albert, Wiesbaden-Biebrich), amounting in all to from 180 to 200 mg. A method was devised for grading roughly the extent of the loss of hair, which was much less when the vitamin D preparation was given. It is suggested that the effect is connected with P metabolism.—E. M. Hume.

See also Absts. 3732, 3801.

Other Vitamins

3725

DE BELLIS, U. and DI GRUTTOLA, G. Prova da carico di vitamina K e funzionalità epatica nell'infanzia. [**Vitamin K load test and liver**

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function in childhood.] *Pediatrics*, 1953, **61**, 906-920. [Ist. Clin. Pediat., Univ. Naples.] French, English, German and Spanish summaries.

Response to an intramuscular injection of 50 mg. vitamin K in shortening of the prothrombin time was estimated in 65 children, aged from 6 months to 11 years, healthy, with various diseases, and with liver diseases. The results were compared with those of other tests for liver function, and it was concluded that the vitamin K test was sensitive, and as satisfactory for children as for adults.

E. M. Hume.

3726

WALKER, C. H. M. and BALF, C. L. **Capillary resistance studies. 1. The newborn infant. 2. Late pregnancy, labour and early puerperium.** *J. Obstet. Gynaecol. Brit. Empire*, 1954, **61**, 1-16; 17-30. [Dept. Child Life and Health, Univ. Edinburgh.]

1. The "critical petechial pressure" is defined as the pressure producing 1 or more petechiae in 60 sec., provided that a negative test was obtained with a pressure lower by 50 mm. Hg. It decreased with the size of the cup used. Bruising or oedema or both increased as the number of petechiae increased. The number of petechiae rose if the infant cried or struggled. No diurnal change in fragility was found. Except where stated the infants studied were mature and free from infection or abnormality at the first testing. The 622 tests made during a year were grouped into those performed during the first 24 hr. of life, on the 2nd to 4th days inclusive, and on the 5th day or later, and the results were classified into those positive at a pressure of 100 mm. Hg or less and those positive at 150 mm. Hg or more. No seasonal trend was shown.

A study of fatal or non-fatal haemorrhage in foetuses and the newborn showed that there was a seasonal trend in the incidence of stillbirths with subarachnoid and intraventricular haemorrhage but in no other group; such cases formed only 9 per cent. of the 665 studied.

During the first week of life, the younger the infant the greater the fragility of the capillaries; the correlation was statistically significant. A similar trend was present in 34 premature infants examined, and their initial values showed a significantly greater fragility than those of full-term infants; bruising and discolouration of the skin were more frequent in the premature babies and were considered as evidence that the capillaries had not developed fully. Capillary resistance increased significantly with increasing birthweight. No significant difference was found between the capillary resistance of infants of mothers who had received vitamin P prophylactically and of mothers who had not. The administration of vitamin K

to the infant had no appreciable effect on resistance during the first week of life. Peripheral cyanosis had no significant effect. Sex, mode of delivery, and presence or absence of jaundice had no apparent effect, and capillary resistance in the newborn appeared to depend chiefly on the maturity of the capillary bed at birth. The possible influence is discussed of such substances as oestrogens and histamine.

2. Antenatal tests were performed between 2 and 4 p.m. and postnatal tests between 10 a.m. and 12 noon. The mothers were between 20 and 30 years of age. Nurses of the same age served as controls and, as the sample was large, the menstrual state was ignored. Vitamin P had no significant effect on the capillary resistance of pregnant women before, during or after delivery, and the results for treated and untreated women are considered together. The results were divided into those positive at or below a pressure of 150 mm. Hg and those positive at 200 and at or above 250 mm. Hg; the test period was 60 sec., not 30 sec. as used by other workers, so that the critical pressure was lower. The mean capillary resistance during the 6 weeks before term was significantly low. During labour, capillary resistance rose and remained high for the 8 to 10 subsequent days during which the women were retested; the mean final resistance value was significantly above that in the normal control group. In 12 patients with minor complications the values did not differ from those of normal subjects. There was no evidence of any relationship between capillary resistance and the duration of red lochia or the blood loss at delivery, and such obstetrical interference as occurred in the series had no appreciable effect except that in the one subject delivered by caesarean section there was no increase in resistance after delivery. The duration of labour also seemed to have no effect on resistance. There was no close relationship between the capillary resistance of the infant and that of its mother.—L. Wills.

3727

SCHNEEGANS, E. and HAARSCHER, A. **Le complexe vitaminique T. Un nouveau facteur de croissance. [The vitamin T complex. A new growth factor.]** *Pédiatrie*, 1953, **8**, 803-815. [Inst. Puéricult., Strasbourg.] English summary.

Twenty-four infants aged from 4 to 16 months, all of them underweight and not gaining satisfactorily, were maintained on an unchanged diet and treated with 25 drops T Vitamin Goetsch (Pharmazell, Raubling, Bavaria) 3 times a day. Thirteen made a good weight response and some had a much improved appetite. There was no intolerance of the preparation.—E. M. Hume.

DENTAL DISEASES

3728

TURNER, N. C., SCRIBNER, J. H. and BELL, J. T. **The relationship of titratable acidity, titratable alkalinity, and pH to the incidence of dental caries.** *J. Dent. Res.*, 1954, **33**, 55-61. [Lab. Biochem., Forsyth Dent. Infirmary Child., Boston, Mass.]

Saliva was collected from 315 children aged from 5 to 11 years who attended for dental treatment. Frequency distributions and summary tables for the statistical treatment of the data are presented. There was evidence that low titratable acidity and high titratable alkalinity characterised patients free from dental decay, and high acidity and low alkalinity were found in those with greater amounts of dental caries.

D. Harvey.

3729

CARR, L. M. **A correlation between Mellanby hypoplasia and dental caries.** *Dent. J. Austral.*, 1953, **25**, 158-160. [Dent. Clin., Dept. Health, Canberra.]

When the enamel of the teeth of 170 children aged from 3 to 4 years was graded in 4 degrees of roughness, an association between caries and roughness was found.—W. M. Deans.

3730

LILIENTHAL, B., GOLDSWORTHY, N. E., SULLIVAN, H. R. and CAMERON, D. A. **The biology of the children of Hopewood House, Bowral, New South Wales. 1. Observations on dental caries extending over five years (1947 to 1952).** *Dent. J. Austral.*, 1953, **25**, 163-168; repr. from *Med. J. Austral.*, 1953, i. [Inst. Dent. Res., United Dent. Hosp., Sydney.]

The diet in Hopewood House was not analysed but consisted mainly of wholemeal bread and biscuits, wholemeal porridge, wheat germ, fresh and dried fruits, raw and cooked vegetables, butter, cheese, eggs, milk and fruit juices, with vitamin concentrates, honey or molasses occasionally for sweetening, and nuts. Sugar, brown as well as white, white flour and tea were excluded and very little meat was used; food was as far as possible uncooked.

Of 81 children of both sexes aged between 4 and 9 years who had spent most of their lives in the home, 63 had no caries on X-ray examination and in the remaining 18 the incidence and rate of development were low. In respect of caries these children far surpassed Sydney children of the same age (Cameron, 1953, in the press) and were superior even to children in New Guinea villages (Abst. 4246, Vol. 20). Lactobacillus counts were generally low and 30 of the children had no lactobacilli

at any time. There was a significant association between caries and the presence of lactobacilli.

W. M. Deans.

3731

PARFITT, G. J. **Report on the condition of the teeth of children in a London school from 1950 to 1953.** *Brit. Dent. J.*, 1954, **96**, 33-35. [Dept. Prev. Dent., Inst. Dent. Surg.]

Between 1950 and 1952 the mean DMF rate increased and the percentage of children without caries decreased in all age groups between 5 and 10 years; in 1953, however, the 5- and 6-year-olds improved in both respects, but not back to the 1950 values.—W. M. Deans.

3732

SELANDER, P. and GRAHNÉN, H. **Rakiten och spasmodiens inverkan på det permanenta bettet. 1. Tandförändringar. [The effect of rickets and spasmophilia on the permanent occlusion. 1. Changes in the teeth.]** *Nord. Med.*, 1954, **51**, 197-203. [Flensburg, Barnsjukhus., Malmö.] English summary.

Literature is reviewed. From the records of the hospital between 1924 and 1941 three groups of subjects were chosen, 201 that had been admitted in infancy with rickets, 127 with spasmophilia and 173 that, on routine inspection, had neither rickets nor spasmophilia. Of these 62, 56 and 64 were traced and re-examined. In the rickets group 26, average age 18.7 years, showed hypoplasia of the enamel, symmetrical in 17; in the spasmophilia group, average age 17.4, there were 46 with hypoplasia, symmetrical in 41; in the control group, average age 15.6, there were 17 with hypoplasia, symmetrical in only 2. Symmetrical defects are considered to represent lesions during early calcification and referable to the diseases in question. There was no detectable difference in kind or severity of the defects between the groups; the defects were confined to incisors, canines and 6th year molars. There was no evidence of special susceptibility to caries.

I. Leitch.

3733

CARR, L. M. **Some considerations prior to experimental fluoridation.** *Dent. J. Austral.*, 1953, **25**, 208-211. [Dent. Clin., Dept. Health, Canberra.]

The problems which require consideration before fluoridation of a water supply is undertaken are considered under 5 headings: (1) the level at which it is to be made, bearing in mind the quantity of water likely to be consumed under prevailing climatic conditions, (2) the intake of F from water and other sources, (3) the population's caries rate, for the measurement of which the DMF-surfaces index is considered best, (4) the incidence of mottling from causes other than F

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intake and (5) the education of the population in what may or may not be expected if fluoridation is undertaken, *e.g.*, immediate inhibition of caries, appearance of toxic effects and interference with industrial processes.—D. Harvey.

3734

ADLER, P. Karies und Urbanisation. [**Caries and urbanisation.**] *Acta med. hung.*, 1954, **5**, 149–168. [Stomatol. Klin., Univ. Debrecen, Hungary.] Russian summary.

Studies made in 1950, 1951 and 1952 of native schoolchildren in 10 large villages or small towns in the Hungarian plain and in the surrounding country showed that the incidence of caries, expressed as the DMF rate, was less in the country children, except in 2 districts where the village children's drinking water contained more F or some other protective substance (see Abst. 1153, Vol. 24). In districts where both groups of children had water of similar F content, the difference was greater in the 12- to 14-year-olds than in the 8- to 9-year-olds, indicating that it is due to some condition affecting the teeth after eruption. Exactly what element in this very slight degree of urbanisation is responsible is not clear. Reliable information on diet was lacking, but little difference seemed likely except that the peasants' children ate more raw vegetables and unripe fruit and had less chance of getting sweets and ice-cream. During the warm half of the year the peasants' children are in the open most of the time, those under school age scantily clad, so that they get more sunshine than the village children.

The increase in caries incidence is no argument against increasing urbanisation, since it can, and should, be combated by fluoridation of the water supplies where necessary.—W. M. Deans.

3735

FORREST, J. R. Fluoridation of water supplies. *Pub. Health*, 1953–54, **67**, 58–62. [Minist. Health.]

See Abst. 5361, Vol. 23.

See also Abst. 3601.

POISONS: PATHOGENIC ORGANISMS: FOOD LAWS

3736

HÖGL, O. Vergleichende Betrachtung der Schädlichkeit von Lebensmittelkomponenten. [**Comparative study of the toxicity of components of foods.**] *Mitt. Geb. Lebensmittel. Hyg.*, 1953, **44**, 484–494. [Eidg. Gesundheitsamt, Berne.] French and English summaries.

In considering the possible toxicity of a component naturally present or admixed in a food it is suggested that the "safety margin" value should be the criterion. This is expressed as the

ratio of the maximum amount of the constituent, just below the toxic dose, which can be ingested safely, and the amount normally ingested with the food. A ratio of 3.3:1 is somewhat narrow in view of possible cumulative effects, but in a number of cases quoted the ratio is 100:1 or higher.

W. Godden.

3737

ABRAMSON, H., GREENBERG, M., PLOTKIN, S. and OLDENBUSCH, C. Food poisoning in infants caused by egg-yolk powder. *Amer. J. Dis. Child.*, 1954, **87**, 1–6. [Bur. Prevent. Dis., Dept. Health, New York.]

3738

JELLIFFE, D. B. and STUART, K. L. Acute toxic hypoglycaemia in the vomiting sickness of Jamaica. *Brit. Med. J.*, 1954, **i**, 75–77. [Dept. Med., Univ. Coll. W. Indies, Mona, Jamaica.]

The striking biochemical finding is the low blood sugar, which ranged from 3 to 19 mg. per 100 ml. in 5 patients aged from 4 to 8 years for whom data are tabulated. Details are given of clinical findings for 1 patient who died but whose treatment with intravenous glucose had been started after coma lasting 7 hr. Two others of the 5 who had been comatose for only 2 and 4 hr. recovered after such treatment.

A toxin is thought to be responsible, but there was no conclusive evidence of its origin in ackee, *Blighia sapida*, a common food in which, when immature, a toxic saponin has been demonstrated. Its source may be some of the wild plants used for making "bush tea".—D. Harvey.

3739

CHAKRAVARTI, R. N. Aetiological rôle of toxic oils in epidemic dropsy. A review. *Indian Med. Gaz.*, 1953, **88**, 117–126. [Dept. Chem., Sch. Trop. Med., Calcutta.]

3740

SPOON, W. Invloed van systemische insecticiden op de cacaoboan. [**Effect of systemic insecticides on cocoa beans.**] *Voeding*, 1954, **15**, 67–73. [Konink. Inst. Tropen.] English summary.

Work on the use of Hanane to control "swollen shoot" (see West, *Rep. Cocoa Conference*, 1951, 86; Nicol, *ibid.*, 1953, 98) is briefly described. Neither the Gambian pouched rat (*Crictomys gambianus*) nor the guineapig would eat enough of the beans to test their toxicity. Plants grown near the cocoa palms contained appreciable quantities of the insecticide.—I. Leitch.

3741

HJORTH, N. Food poisoning from cod-roie contaminated by mustard gas. A report with

five case histories. *Acta med. scand.*, 1953, **147**, 237-245. [Dept. Med., Finsen Inst., Copenhagen.]

3742

SVOBODA, J. Význam ryb a rybích výrobků při alimentárních toxoinfekcích a intoxikacích. [The importance of fish and fish products for alimentary toxo-infections and intoxications.] *Veterinářství*, 1953, **3**, 143-145. [Vet. Fac., Agric. Univ., Brno.] In Czech.

A review of literature about the possible infection of fish by micro-organisms which may be pathogenic for man, and about the toxicity to man of some substances derived from fish such as the excretions of skin glands of lamprey, blood serum of eel or roe of barbel.

P. Prokšová (Czechoslovakia).

IMMUNITY

3743

CHANDLER, A. C. The relation of nutrition to parasitism. *J. Egypt. Med. Assoc.*, 1953, **36**, 533-552. [Res. Inst. Trop. Dis., Cairo.]

A review.

THERAPEUTIC AND PREVENTIVE DIETETICS

GENERAL

3745

VAN ITALLIE, T. B., MAYER, J. and STARE, F. J. Nutrition in clinical medicine. *New Engl. J. Med.*, 1954, **250**, 199-210. [Dept. Nutrit., Harvard Sch. Pub. Health, Boston, Mass.]

A review with 98 references.

3746

KEETON, R. W. Nutrition and appetite training during illness. *J. Amer. Med. Assoc.*, 1953, **151**, 253-260. [Chicago, Ill.]

Literature which is a guide to the maintenance of adequate nutrition during illness is reviewed. The problem of loss of appetite is considered and 4 case reports are given to show the effectiveness of appetite training which consisted in giving only one or two meals a day. Meals were increased in size and in number when all food was being eaten.

F. C. Aitken.

3747

CALLOWAY, N. O. and MOWREY, F. H. Red blood cells as source of protein for parenteral use. *J. Amer. Med. Assoc.*, 1953, **152**, 777-781. [Med. Serv., Percy Jones Army Hosp., Battle Creek, Mich.]

Since 300 ml. of packed red cells contain 90 g. protein as Hb, they form a much more concentrated source of protein than the usual amino-acid

3744

GLASER, J. and JOHNSTONE, D. E. Prophylaxis of allergic disease in the newborn. *J. Amer. Med. Assoc.*, 1953, **153**, 620-622. [Dept. Paediat., Sch. Med., Univ. Rochester, N.Y.]

Since food sensitivities are much commoner in the first few months of life than later and it is believed that this is due to immaturity of immunological safeguards, cow's milk was withheld from 96 infants, offspring or siblings of persons with allergic disease, for several weeks or months after birth; 88 were given soya bean milk mixtures, 5 meat base mixtures, and 3 were entirely breast fed. Lactating mothers were forbidden eggs and cheese and limited to 1 pint boiled milk daily. Ca and P were supplied by medication. There was a control group of 65 siblings and another group of 175 non-related controls from allergic families. During follow-up periods ranging from 7 months to 10 years, 14 (15 per cent.) of the experimental group, 42 (65 per cent.) of the sibling control group and 91 (52 per cent.) of the non-related control group developed major allergy; the difference was significant.—W. M. Deans.

or protein solutions for parenteral use; and large amounts are discarded by blood banks.

In 8 patients with liver cirrhosis or the nephrotic syndrome, for 4 of whom case histories are given, repeated transfusions with 250 ml. packed red cells improved not only Hb values and red cell counts but also clinical condition and serum protein values. N balance data suggested that the red cells were utilised as a source of protein. No ill effect was seen.—W. M. Deans.

3748

BERGER, H. Physiologische Grundlagen des Aminosäurenstoffwechsels und ihre Bedeutung für die Therapie. [Physiological bases of amino-acid metabolism and its significance for treatment.] *Schweiz. med. Wochenschr.*, 1953, **83**, 761-764. [Kinderklin., Jenner Spital, Univ. Berne.]

The paper is a lecture on the use of amino-acids in treatment and is illustrated from the author's own experience in estimating amino-N in the blood and urine of hospital patients aged from 2 weeks to 15 years, treated with the amino-acid mixture Nesmida.—E. M. Hume.

3749

SWAMINATHAN, N. Proteins and protein hydrolysates in nutrition. *Antiseptic*, 1954, **51**, 87-91. [King Inst., Guindy.]

N.A. and R., July 1954

3750

REVERS, F. E. Eiwitstofwisseling van chirurgische patiënten. [**Protein metabolism of surgical patients.**] *Voeding*, 1954, **15**, 16-31. [Rijks-Univ., Utrecht.] English summary.

A review, with particular reference to the provision of adequate energy and protein for patients who have had operations on the gastro-intestinal tract.—I. Leitch.

3751

GHOSH, S. M. **Protein and vitamin deficiencies in surgical patients.** *Antiseptic*, 1953, **50**, 869-872. [Dept. Surg., Calcutta Nat. Med. Coll.]

3752

MINDRUM, G. M. **The use of fat supplements in the nutrition of critically ill patients.** *J. Clin. Nutr.*, 1953, **1**, 503-512. [Dept. Int. Med., Med. Sch., Univ. Cincinnati, Ohio.] Spanish summary.

Nine critically ill, protein-depleted patients were given fat emulsions by mouth or stomach tube as supplement to the hospital diet. A typical emulsion consisted of 50 per cent. oil, 12 per cent. sucrose, 2 per cent. emulsifying agent, flavouring and water. Such a mixture supplied 5.1 Cal. per ml. To 100 ml. of this mixture 23 g. skimmed milk powder could be added with little change in volume. The average energy intake from hospital diet was less than 2000 Cal. This was increased to over 4000 Cal. daily by the supplement. During observation periods of from 30 to 120 days patients showed clear improvement, weight gain, increased resistance to infection, accelerated rate of wound healing and a sense of wellbeing.—F. C. Aitken.

3753

GOLDBERG, E. M., STEIN, I. F. (Jr.) and MEYER, K. A. **Administration of fat emulsion by mouth, gastrotomy, and jejunostomy.** *J. Amer. Med. Assoc.*, 1952, **150**, 1665-1667. [Dept. Surg., Northwestern Univ. Med. Sch., Chicago, Ill.]

A 40 per cent. emulsion of groundnut oil was used in the feeding of 90 patients, who, because of lesions of the mouth, oesophagus or stomach, were unable to take sufficient food and were undernourished. Details of the regime are given. The emulsion was given either as a supplement to a fluid or light diet or, if swallowing was impossible, as the basis of a complete diet, in which case it was supplemented with a protein concentrate, minerals and vitamins. The average daily intake was 764 ml. by mouth or about 650 ml. by tube. About half of the patients developed signs of intolerance, but these were generally not severe enough to necessitate stopping the emulsion. There was gain of weight and improvement in the

general condition of most patients except those with advanced malignant disease.—L. Wills.

3754

MOORE, F. D. **The low sodium syndromes of surgery: an outline for practical management.** *J. Amer. Med. Assoc.*, 1954, **154**, 379-384. [Dept. Surg., Peter Bent Brigham Hosp., Harvard Med. Sch., Boston, Mass.]

The 3 basic types of low-serum Na seen in patients after surgical treatment are described: (1) the sodium paradox, where there is normal body Na and body water with low serum Na; (2) water intoxication, where there is normal body Na but too much water with low serum Na; (3) Na deficiency, where there is low body Na with low or normal body water. Usually in Na deficiency the extrarenal loss is high and urine Na is low; relatively rarely the opposite is found with adrenal or renal tubular failure.

With such a diversity of syndromes treatment ranges from careful nursing only to prompt administration of 3000 m. equiv. Na or administration of 9 mg. deoxycorticosterone acetate. Great importance is attached to careful observation and diagnosis.—F. C. Aitken.

3755

RUPHAEL DIVO, M. Dietas hiposodicas y resinas. [**Diets low in sodium and with resins.**] *Arch. venezol. Nutricion*, 1952, **3**, 287-298. [Inst. Nac. Nutrición.] English and German summaries.

A review.

3756

STAUB, H. Pathogenese und Diät der Hypertonie. [**Pathogenesis of and diet in hypertonus.**] *Deutsch. med. Wochenschr.*, 1954, **79**, 1-6. [Klin. Med., Univ. Basle.]

A review.

See also Abst. 3250.

DIABETES

3757

ROCHA, A. **Contraindicación de regímenes glucoprivos en ciertos diabéticos. [Contraindication of diets low in carbohydrate for certain diabetics.]** *Rev. española Enferm. Apar. digest. Nutricion*, 1953, **12**, 581-584. [Hosp. Santa Cruz. y San. Pablo, Barcelona.] French and English summaries.

The use of diets excessively low in carbohydrate is contraindicated in diabetes with concomitant hepatitis. Severe deprivation of carbohydrate would diminish the functional capacity of the liver cell, and this would eventually have a harmful effect on the evolution of the diabetes. Maintaining the carbohydrate intake does not call for

insulin medication, since that would tend to deplete the liver of the glycogen so necessary for the unhealthy liver cell. Hence the dietary regimen cannot be the same for all diabetics, but must be modified for each particular case. Estimation of serum cholinesterase will help in the differentiation; its value is normal, or even high, in pure pancreatic insufficiency, but low in diabetic hepatitis, which is commoner than is generally supposed.—M. B. Richards.

3758

ARIAS VALLEJO, E. Profilaxis dietética social de la diabetes. [**Dietetic prophylaxis of diabetes.**] *Rev. española Enferm. Apar. digest. Nutricion*, 1953, **12**, 559–569. French and English summaries.

3759

WHITE, P., KOSHY, P. and DUCKERS, J. **The management of pregnancy complicating diabetes and of children of diabetic mothers.** *Med. Clin. N. Amer.*, 1953, **37**, 1481–1496. [Joslin Clin., Boston, Mass.]

A useful review based on the unrivalled experience of the Joslin Clinic since 1936, and including data on the growth and other characteristics of the children of diabetic mothers.—A. M. Thomson.

3760

CARDELL, B. S. **The infants of diabetic mothers: a morphological study.** *J. Obstet. Gynaecol. Brit. Empire*, 1953, **60**, 834–853. [Dept. Morbid Anat., King's Coll. Hosp. Med. Sch., London.]

Post-mortem examinations were made of 25 infants of gestational age from 30 to 37 weeks, all but one stillborn or dying within 24 hr., whose mothers were diabetic, and of 64 infants of normal mothers; also of 21 fetuses of gestational age from 14 to 26 weeks, of which 5 were from diabetic mothers. Body length, bodyweight and organ weights are plotted against gestational age.

The infants of diabetic mothers were longer and heavier and had heavier organs than infants of normal mothers. The increases in length and organ weights were related to the increase in bodyweight, except that the brain tended to be lighter, and in 4 the heart was significantly enlarged. The fetuses did not show the increase in bodyweight. Bone structure and ossification were normal. In 13 of 18 infants the pancreas showed an increase of islet tissue, due to an increase of beta cells and closely correlated with bodyweight (Cardell, *J. Pathol. Bacteriol.*, 1953, **66**, 335).

The reasons for the high mortality and abnormalities in the infants of diabetic mothers remain unknown. Overactivity of the anterior pituitary of the mother has been suggested; the author

considers this theory "attractive but not yet supported by adequate evidence", and suggests that heredity may also play a part. Further investigation is called for.—W. M. Deans.

3761

WILKERSON, H. L. C. and KRALL, L. P. **Diabetes in a New England town: report of four year progress study of the Oxford, Mass., diabetes survey of 1946–1947.** *J. Amer. Med. Assoc.*, 1953, **152**, 1322–1328. [Boston, Mass.]

Cf. Title 5083, Vol. 17.

3762

DANOPOULOS, E. and ANGELOPOULOS, B. Vergleichende Untersuchung über die Veränderung des Diabetes in dem Vorkriegs-, Kriegs- und Nachkriegsjahren in Griechenland. [**Comparison of changes in diabetes in Greece in the periods before, during and after the war.**] *Klin. Wochenschr.*, 1953, **31**, 1076–1077. [I. Med. Klin., Univ. Athens.]

It has generally been observed that the incidence of diabetes declines in times of food shortage. In Greece during the war, food conditions were bad, especially in the winter of 1941–42. In the Athens University Clinic, the number of cases of diabetes treated in the year was in the years 1936–40 between 32 and 50 for a total of 1500 to 2500 patients, but in the years 1941–44 it was only from 5 to 7 though the total number of patients seen was no less than before the war. After the war the numbers rose again to the pre-war level and included a larger proportion than before the war of severe diabetes, difficult to stabilise. The improvement during the war is attributed to consumption of a diet largely vegetarian. Tests of the suggestion are being made.—E. M. Hume.

3763

ROSECAN, M. and DAUGHADAY, W. H. **A comparison of insulin treatment with and without added carbohydrate in human diabetic ketosis.** *J. Clin. Invest.*, 1954, **33**, 49–56. [Dept. Int. Med., Sch. Med., Washington Univ., St. Louis, Mo.]

For the comparison, ketosis was induced 20 times in 8 diabetic patients. Blood ketones fell more rapidly when insulin treatment was combined with intravenous administration of fructose or glucose. The period of high blood sugar was shorter and glycosuria was less after fructose than after glucose as an adjunct to insulin treatment.

F. C. Aitken.

3764

DARRAGH, J. H., WOMERSLEY, R. A. and MERONEY, W. H. **Fructose in the treatment of diabetic ketosis.** *J. Clin. Invest.*, 1953, **32**, 1214–1221.

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[Dept. Int. Med., Sch. Med., Yale Univ., New Haven, Conn.]

Fructose injected intravenously disappeared from the blood of subjects with diabetic ketosis, whether receiving insulin or not, at the same rate as in normal subjects. Only small amounts of fructose were excreted in the urine. If fructose is used in place of glucose, with adequate amounts of insulin, carbohydrate can be administered early in the course of treatment of diabetic ketosis, without increasing the effective osmotic pressure of the extracellular fluid. When 2.5 per cent. fructose in 0.45 per cent. saline was infused the dehydration associated with diabetic ketosis was corrected by the achievement of a large positive balance of water, Na and chloride.—W. Godden.

3765

MARTIN, M. M. **Diabetic neuropathy. A clinical study of 150 cases.** *Brain*, 1953, **76**, 594-624. [Dept. Diabetes, King's Coll. Hosp., Denmark Hill, London, S.E.]

3766

VENNING, G. R. **The insulin-zinc suspensions.** *Lancet*, 1954, **266**, 480-486. [Univ. Dept. Med., Royal Infirmary, Manchester.]

3767

GOODMAN, J. I. and HELLER, A. **An analysis of insulin (hypoglycemic) reactions in diabetic patients. 1. Statistical survey of 203 cases.** *Amer. J. Digest. Dis.*, 1954, **21**, 9-12. [Cleveland Heights, Ohio.]

GASTRO-INTESTINAL CONDITIONS

3768

CORREA, F. W. **Dehydration in children.** *Indian J. Pediat.*, 1954, **21**, 1-15. [Dept. Paediat., Med. Coll., Calcutta.]

Haematocrit value, total chloride in blood and urine and, in some, plasma CO₂-combining power are tabulated for 30 infants and children between 4 and 42 months old with dehydration due to diarrhoea with or without vomiting. All were underweight and anaemic and many had signs of vitamin A or vitamin B complex deficiency. Four were breast fed, 18 breast fed with cow's milk in addition, 1 had tinned milk and 7 mixed diet.

All were suffering from combined water and electrolyte deficiency. The 13 who died showed high haematocrit value, low plasma CO₂-combining power and low blood and urinary chloride compared with those who recovered. Estimation of plasma CO₂-combining power is recommended as a guide to prognosis and treatment.

Treatment was by intravenous saline with 5 per cent. glucose, followed by fluids by mouth as

soon as possible, and later by diluted skimmed lactic acid milk. It is suggested that better results might be obtained by supplying, after the initial stage, potassium and 1/6 M lactate also, as recommended by Darrow *et al.* (*J. Paediat.*, 1949, **4**, 604).
W. M. Deans.

3769

LOWDON, G. M. **Infantile gastro-enteritis.** *Edinb. Med. J.*, 1954, **61**, 84-95. [Royal Hosp. Sick Child., Edinburgh.]

A Honyman Gillespie lecture.

3770

DOUTHWAITE, A. H. and THORNE, M. G. **Further studies on the reduction of gastric acidity.** *Brit. Med. J.*, 1954, **i**, 183-184. [Guy's Hosp., London.]

In an extension of earlier work (Abst. 983, Vol. 23) 12 patients with chronic peptic ulcer and taking ordinary meals were studied while taking alkaline or dummy tablets. Over periods generally of 2 hr. during which 2 to 8 tablets were eaten the alkaline tablets regularly raised the pH of the stomach contents in comparison with the dummy tablets.

From experience of the use of large numbers of these tablets no ill effect can be foreseen, and sucking them may reduce the tendency to relapse in the symptom-free patient.—D. Harvey.

3771

STEIGMANN, F. and GOLDBERG, E. **Control of gastric acidity by a new way of antacid administration.** *J. Lab. Clin. Med.*, 1953, **42**, 955. *Proc.* [Chicago, Ill.]

3772

HYMAN, S., HARDT, L. L. and STEIGMANN, F. **The increased antacid effect of aluminium hydroxide combined with magnesium trisilicate.** *Amer. J. Digest. Dis.*, 1954, **21**, 1-4. [Dept. Int. Med., Cook County Hosp., Chicago, Ill.]

3773

EVANS, P. R. C. **Value of strict dieting, drugs, and "Robaden" in peptic ulceration.** *Brit. Med. J.*, 1954, **i**, 612-616. [Wrexham Group Hosps.]

Four methods of treatment were compared: (1) strict diet with drugs and strict rest in bed; (2) as in (1) with the addition of Robaden, a proprietary preparation of protein-free extracts of fresh animal stomach and small intestine; (3) post-ulcer diet and 2 hr. up and about daily; (4) as in (3) with the addition of Robaden. The patients allotted in rotation to the treatment groups were 27 with gastric and 87 with duodenal ulcer. The duration of strict diet treatment was 1 month in hospital and 3 weeks at home, after which the post-ulcer diet was allowed. The post-ulcer diet

groups also went home after 1 month in hospital. Patients treated with Robaden were given it for 5 months.

The results of a follow-up study for at least 6 months indicated no advantage of strict dieting and strict rest over post-ulcer diet with less strict rest. Robaden had no beneficial effect.

F. C. Aitken.

3774

GONZALEZ GALVAN, J. M. Resultados obtenidos con el extracto total de estómago y duodeno en el tratamiento del ulcus gastroduodenal. [Results obtained in the treatment of gastroduodenal ulcer with a whole extract of stomach and duodenum.] *Rev. española Enferm. Apar. digest. Nutric.*, 1954, **13**, 51-62. [Beneficencia Municipal, Seville.] English summary.

Favourable results were obtained with Robudén, a whole extract of stomach and intestine, in the treatment of 52 patients suffering from gastric or duodenal ulcer. Symptoms such as pain, nausea, acidity and spasms disappeared, as did also haemorrhages. There was a general improvement in the weight and morale of the patient and the improvement in the condition was confirmed by X-ray examination. As a rule patients can be treated without interference with their normal occupations, and without the imposition of extreme diets, but not those who clearly require surgical treatment. Detailed case histories of 8 patients are given.—M. B. Richards.

3775

OLSON, W. H. and NECHELES, H. A study on the use of piromen® for the treatment of duodenal ulcer in man. *Amer. J. Digest. Dis.*, 1953, **20**, 372-380. [Dept. Gastro-intestinal Res., Med. Res. Inst., Michael Reese Hosp., Chicago, Ill.]

On the argument that fever and bacterial toxins inhibit gastric secretion and inhibit movement experiments were made with pyrogens which were found to do both. Piromen, "a pyrogenic polysaccharide of bacterial origin", was found to accelerate healing of skin wounds in rabbits. It was tested on inmates of a penitentiary where the incidence of duodenal ulcer is high. There were 52 men with confirmed ulcer. From these 5 were given a placebo with immediate subjective improvement but no real effect; 14 were given Piromen injections and of these 11 showed healed ulcers without change of acidity after from 21 to 44 days. After leaving hospital 5 had Piromen once a week and continued well; only 2 of the other 9 remained well.

A further group of 11 men were treated without hospitalisation; 8 improved and 7 showed healed ulcers.—I. Leitch.

3776

DUFAULT, F. X. (Jr.) and TOBIAS, G. J. Potentially reversible renal failure following excessive calcium and alkali intake in peptic ulcer therapy. *Amer. J. Med.*, 1954, **16**, 231-236. [New England Centre Hosp., Boston, Mass.]

Renal signs with raised levels of urea and Ca in blood developed in 4 patients who had taken excessive amounts of NaHCO₃ and/or CaCO₃ and up to 3 quarts of milk a day for long periods for the relief of ulcer pain. The differential diagnosis from other types of kidney disease and from high blood Ca due to other causes was based on the finding of ocular calcification, the absence of bony changes, the history of excessive intake of soluble alkali and milk and the return to normal of kidney function after the withdrawal of these from the diet.—L. Wills.

3777

ZOLLINGER, R. M. and ELLISON, E. H. Nutrition after gastric operations. *J. Amer. Med. Assoc.*, 1954, **154**, 811-814. [Dept. Surg., Coll. Med., Ohio State Univ.]

Records of weight gain or loss one to six years after operation were used as an index of nutritional state of 203 unselected ulcer patients subjected to standard surgical procedures. There were 176 patients with duodenal ulcer and 27 with benign gastric ulcer. Subjects were considered in 3 groups. Group 1 contained the patients whose pre-operative weight was ideal or above; group 2 contained those who had realised their ideal weight at some time previous to, but not immediately before, the operation; group 3 contained those who had never attained their ideal weight before operation. Of the duodenal ulcer cases two-thirds of those in group 1 attained ideal weight after operation, regardless of the severity of the surgical procedure; the overall proportion in group 2 was lower and varied indirectly with the severity of the surgical procedure; none of the patients in group 3 attained ideal weight after operation. It is suggested that in duodenal ulcer the surgical procedure should be selected with regard to the weight of the patient in relation to his or her ideal weight.

Of the gastric ulcer patients 22 and 21.4 per cent. of those in groups 1 and 2, respectively, attained ideal weight after operation, but none of those in group 3 did. The danger of malignancy in such patients makes radical resection necessary, regardless of pre-operative weight.—F. C. Aitken.

3778

RODRIGUEZ-MOLINA, R. Fundamental concepts in the diagnosis of sprue. *Ann. Int. Med.*, 1954, **40**, 33-41. [San Juan, Puerto Rico.]

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3779

Malabsorption syndrome. *Amer. J. Med.*, 1953, 15, 790-803. [Coll. Phys. Surg., Columbia Univ., New York.]

Report of a symposium, dealing mainly with coeliac disease and sprue.

3780

STEIGMANN, F., GOLDBERG, E. M. and SCHOOLMAN, H. M. **The effect of emulsifying agents (Tween 60 and Span 60) on the gastro-intestinal tract.** *Amer. J. Digest. Dis.*, 1953, 20, 380-384. [Hektoen Inst. Med. Res., Cook County Hosp., Chicago, Ill.]

In extensive studies of bowel function before and after the daily administration for 28 days of 6 g. of either emulsifying agent, no significant change was produced.—L. Wills.

THYROID DISEASE

3781

BLUM, F. Studien zum Kropfproblem. 5. Kropfaufbau und Kropfarten. Experimentelle Studie. [Studies of the goitre problem. 5. Formation and kinds of goitres. Experimental study.] *Schweiz. med. Wochenschr.*, 1953, 83, 513-518. [Zürich.]

The author expresses certain of his conclusions in a general article and adduces in support of them specimen experiments from among those he has made.

Goitre in rabbits and other animals caused by a diet of cabbage is different from goitre caused by sulphur compounds like thiourea. In cabbage goitre, the dietary I offered to the thyroid gland is in an unavailable form and the gland becomes filled with inactive material. When free I is offered it can be used, and active substance may be formed in amount greater than can be stored in the gland until there has been time for the inactive substance to be removed. An excess of active substance is then left in the circulation and signs like those of Graves' disease appear. This state can be maintained almost indefinitely by suitable dosage with I; the gland is, however, capable of being restored to normal.

In the goitre caused by giving sulphur compounds, even colloidal S, it is an enzyme which is damaged and, if the intoxication lasts long enough, the enzyme is irreparably destroyed and free I offered to the gland cannot be used. In rabbits and rats, goitres were produced by feeding the animals for 3 months with a culture of purple sulphur bacteria. When I was given there was little reaction, showing that the bacteria acted by damaging the enzyme. It is suggested that the intestinal flora of human beings may at times include such goitrogenic organisms.

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For parts 1, 3 and 4 of this series see Absts. 506, Vol. 12, 710, Vol. 14 and 552, Vol. 20.

E. M. Hume.

3782

HASHIBA, T., OGAWA, M. and OTSUKA, R. [Surveys and studies on endemic goiter in Hidaka, Hokkaido.] *Sapporo Med. J.*, 1952, 3, 252-256. [Dept. Surg., Sapporo Univ. Med.] In Japanese: English summary.

Among 4683 schoolchildren aged from 6 to 18 years the incidence of goitre was 3.05 per cent. Distribution was not uniform; goitre was more common in the eastern part of the Erimo peninsula, where 12 per cent. of the children were affected. Investigation of the cause is being continued. (From summary).—D. Harvey.

3783

OKII, K. [Studies on distribution of the endemic goiter in Hokkaido. The investigation in Esashi district.] *Sapporo Med. J.*, 1952, 3, 329-331. [Dept. Surg., Sapporo Univ. Med.] In Japanese: English summary.

In a population of 2234 the incidence of goitre was 2.3 per cent., and the degree of hypertrophy was, in general, greatest in areas where the disease was commonest. (From summary).—D. Harvey.

3784

PERINETTI, H., YACIOFANO, C. A., STANELONI, L. and NORA, J. N. Nuestra experiencia medico quirurgica sobre bocio en una zona endemica. [Recent medico-surgical experience of goitre in an endemic area.] *Rev. Fac. Ciencias méd.* "Dr. Thomas Peron", 1952, 1, No. 3, 7-24. [Inst. Bocio, Univ. Nac. Cuyo.]

Goitre is common in the province of Mendoza in Argentina. A survey of 52,548 schoolchildren in 1940 revealed its presence in 46 per cent. The drinking waters contain little iodine, and the use of iodised salt is recommended.—E. M. Hume.

3785

VAN LEEUWEN, E. Een vorm van genuine hyperthyreose (M. Basedow zonder exophthalmus) na gebruik van geijodeerd brood. [A form of true hyperthyroidism (Graves' disease without exophthalmos) after eating iodised bread.] *Nederland. Tijdschr. Geneesk.*, 1954, 98, 81-89. [Emmen.] English summary.

Goitre prophylaxis in the Netherlands since 1942 has been organised on the basis of the use of iodised salt in baking bread. Up to March 1948 the salt contained 26 mg. KI per kg. and thereafter 39 mg. With bread rationed at 1800 g. weekly the daily extra I from bread was about 100 μ g. When rationing ended and consumption rose to 300 or

400 g. daily, extra I would be approximately 120 to 160 μ g. daily. In August 1948 the baking of bread with iodised salt began in the towns of Emmen and Odoorn. During the 10 preceding years, Graves' disease occurred in classical form in only 9 patients. In 1949 there were 19, in the 3 following years 17, 17 and 5 patients with hyperthyroidism without exophthalmos, in most of them without goitre, and with an age distribution extending into old age. In 1953 no further case appeared. Treatment of those affected, by omission of iodised salt, was not uniformly effective.

I. Leitch.

3786

GALBRAITH, H. J. B., NASH, D. F. E. and SPENCE, A. W. **Iodothiouracil in treatment of toxic goitre.** *Brit. Med. J.*, 1954, i, 420-422. [St. Bartholomew's Hosp., London.]

Of 23 patients treated with 200 or 300 mg. iodothiouracil daily for from 12 days to 7 months, 18 subsequently underwent thyroidectomy. Six others were given simultaneously before operation equivalent doses of thiouracil as methylthiouracil, and of iodine. With such treatment there took place within a week an increase in weight, reduction of the B.M.R. and clinical improvement. It is concluded that either method is satisfactory for pre-operative treatment and preferable to the giving of thiouracil and I separately in preparation for operation.—B. W. Simpson.

3787

GODLEY, A. F. and STANBURY, J. B. **Preliminary experience in the treatment of hyperthyroidism with potassium perchlorate.** *J. Clin. Endocrinol.*, 1954, 14, 70-78. [Dept. Med., Harvard Med. Sch., Boston, Mass.]

A therapeutic trial was made of perchlorate in the treatment of 24 patients with the classic signs of Graves' disease, the dosage being usually 200 to 400 mg. every 8 hr. Some were given iodide in addition to perchlorate before operation and some received perchlorate on a continuing basis. The results were promising. The only toxic sign encountered was irritation of the gastrointestinal tract and it was not certain that the drug was responsible for this. It is suggested that potassium perchlorate may be an effective antithyroid agent in the pre-operative or continuous treatment of thyrotoxicosis, especially in patients where drugs of the thiourea group or iodide have failed or are not tolerated, but the possibility of other reactions must be borne in mind.—B. W. Simpson.

See also Abst. 3232.

ANAEMIA

3788

HALL, B. E. **Diagnosis and treatment of nutritional anemia.** *J. Amer. Med. Assoc.*, 1953,

151, 1-8. [Stanford Univ. Sch. Med., San Francisco, Calif.]

A lecture report.

3789

WINTROBE, M. M. and CARTWRIGHT, G. E. **The management of anemias.** *Med. Clin. N. Amer.*, 1953, 37, 1191-1202. [Dept. Med., Coll. Med., Univ. Utah, Salt Lake City.]

3790

BETKE, K. **Über die Genese der Frühgeburtenanämie und der Trimenonanämisierung. [Etiology of anaemia in premature infants and the anaemia of infants born at term.]** *Ztschr. Kinderheilk.*, 1953, 74, 85-94. [Kinderklin., Univ. Freiburg i. Br.]

3791

NICCOM, W. L., JACKSON, R. L. and STEARNS, G. **Use of ferric and ferrous iron in the prevention of hypochromic anemia in infants.** *Amer. J. Dis. Child.*, 1953, 86, 553-567. [Dept. Paediat., Coll. Med., State Univ. Iowa.]

Artificially-fed fulltime, premature and immature infants were given in milk 5 mg. Fe daily from 3 to 6 months of age and 10 mg. Fe daily from 6 months of age.

In 37 term infants given ferrous sulphate mean Hb values at 29 and 38 weeks were significantly higher than values of 115 term infants given ferric ammonium citrate. Of the 115 infants 16 had severe infections, but the amounts of ferric Fe given sufficed to maintain Hb values above 10 mg. per 100 ml. Four somewhat premature infants who were given ferrous sulphate were able to maintain Hb values greater than 10 mg. per 100 ml. Of the immature infants studied, a set of twins and a set of triplets, 4 were given blood transfusions to bring Hb values near normal. Thereafter the treatment with Fe as ferric ammonium citrate maintained Hb values above 10 mg.—F. C. Aitken.

3792

ADAMS, E. B. **Anaemia in kwashiorkor.** *Brit. Med. J.*, 1954, i, 537-541. [King Edward VIII Hosp., Durban.]

Twenty-one patients with pitting oedema, dermatosis and low plasma proteins were selected for a study of blood. Ages ranged from 1 to 5 years. The diet treatment was soured milk with or without a hydrolysed protein preparation. Eleven children recovered completely, 3 died and 7 were removed from hospital before recovery was complete.

The lowest Hb levels, often recorded after treatment was beginning to give clinical improvement, were below 9 g. in 14 and below 7 g. in 6

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children. Bone marrow was normal in 13. There was megaloblastic change in 2. Six had giant metamyelocytes and some red cell precursors of intermediate type.

The possible relationship of anaemia in kwashiorkor to protein deficiency is discussed.

F. C. Aitken.

3793

DAVIS, L. R. and JENNISON, R. F. **Response of the "physiological anaemia" of pregnancy to iron therapy.** *J. Obstet. Gynaecol. Brit. Empire*, 1954, **61**, 103-108. [King's Coll. Hosp. Med. Sch., London.]

Women numbering 221 and believed to be about 32 weeks pregnant were selected for study; the number was later reduced to 174 by the rejection of those who were considered to have been pregnant for less than 30 or for more than 34 weeks. The mean Hb level of these 174 was 78.14 per cent. (Haldane); the distribution of levels is shown diagrammatically. Before further study 89 more patients were excluded because of irregular attendance at the clinic, confinement at home or initial Hb below 70 or over 88 per cent. The remaining 85 patients were subdivided into 2 groups according as Hb was initially above or below 80 per cent. and in each subgroup approximately half the patients received iron in the form of 2 uncoated tablets of FeSO_4 (B.P.) thrice daily. Significantly raised packed cell volumes and Hb levels at term were found in the treated as compared with the control patients, and among the treated the scatter of levels was narrower. Less consistent changes were found in the mean corpuscular Hb concentrations. Serum Fe was unaffected. It is concluded that the "physiological anaemia" of pregnancy is a result of Fe deficiency.—A. M. Thomson.

3794

CHATTERJEE, J. B. and DAS GUPTA, C. R. **Dimorphic anaemia.** *Indian Med. Gaz.*, 1953, **88**, 126-144. [Dept. Haematol., Sch. Trop. Med., Calcutta.]

Detailed clinical, haematological, biochemical and therapeutic investigations were made of 103 patients with deficiency anaemias, 27 of whom were diagnosed as having dimorphic anaemia. This type of anaemia cannot be diagnosed clinically and the biochemical findings are non-specific. The peripheral blood picture is also non-specific, but the diagnosis is possible from an examination of the bone marrow. Three different pictures may be seen. The presence in a wholly normoblastic marrow of abnormal giant stab cells, metamyelocytes and megakaryocytes is considered diagnostic of deficiency of anti-megaloblastic factors. The diagnosis can be confirmed or, in the absence of a marrow examination, may be made on the results

of treatment, since complete haematological remission is obtained only if both Fe and anti-megaloblastic substances are given.—L. Wills.

3795

HAUSMANN, K. Zur oralen Dauertherapie der perniziösen Anämie. [**Prolonged treatment by mouth of pernicious anaemia.**] *Deutsch. med. Wochenschr.*, 1954, **79**, 106-108. [Allg. Krankenhaus St. Georg, Hamburg.]

Ten patients were treated for 7 to 10 months with 10 to 30 μg . vitamin B_{12} plus 5 to 15 mg. folic acid by mouth; in 7 haematological findings were favourable and no nerve signs developed. Three patients who developed signs of nervous system involvement and slight haematological relapses responded to parenteral treatment with either vitamin B_{12} or liver extract.—L. Wills.

See also Absts. 3658-3669, 3674, 3675, 3677-3680, 3685.

OTHER CONDITIONS

3796

DECOURT, J. L'anorexie mentale au temps de Lasègue et de Gull. [**Anorexia nervosa in the time of Lasègue and Gull.**] *Presse méd.*, 1954, **62**, 355-358. [Paris.]

A historical article.

3797

HUDSON, F. P., IRELAND, J. T., OCKENDEN, B. G. and WHITE-JONES, R. H. **Diagnosis and treatment of galactosaemia.** *Brit. Med. J.*, 1954, **i**, 242-245. [Alder Hey Child. Hosp., Liverpool.]

Clinical descriptions are given of 4 cases of abnormal metabolism of lactose by infants, of whom 3 died. In 2 of these there was positive evidence of high galactose content of the blood but in the third a presumptive diagnosis of the disease was made from its appearance later in a sibling. The infant which survived was given Nutramigen imported from the United States because no lactose-free infant food is prepared in Britain. The question of consanguinity of the parents has not received sufficient attention to confirm the suggestion that the disease is due to a recessive gene in homozygous form.—D. Harvey.

3798

JOHNSON, J. **Cataracts in galactosemia.** *Amer. J. Ophthalmol.*, 1953, **36**, 1380-1386. [Dept. Ophthalmol., Univ. Texas Med. Branch, Galveston.]

The signs of the disease are described; besides cataract, jaundice and hepatomegaly are prominent. The cases reported in the literature in and after 1945 are tabulated. Three patients, a girl of 3 weeks, a girl of 4 months and a boy of one year,

25

are described. Improvement began at once when milk was replaced by a soya bean preparation. The importance of diagnosis and treatment before the third month of life is stressed; otherwise the opacities in the lens become irreversible.

E. M. Hume.

3799

MCAULEY, F. D. **Cataracts in galactosaemia.** *Brit. J. Ophthalmol.*, 1953, **37**, 655-660. [London.]

The signs of the disease are described. Galactosaemia is reported in 2 boys, 12 days and 4 weeks old. Lactose was excluded from the diet, and the opacities in the lens gradually improved.

E. M. Hume.

3800

DELTHIL, P. L'intolérance au saccharose chez l'enfant. [**Sugar intolerance in children.**] *Presse méd.*, 1953, **61**, 1643-1645. [Paris.]

Skin, digestive and nervous troubles in young artificially fed infants otherwise in good condition and gaining weight regularly may arise from intolerance for sucrose, probably due to insufficient secretion of invertase. The stools may have a high pH and may contain a high proportion of Gram-negative organisms. A conclusive test is to substitute some other sugar, preferably β -lactose added to the feed at the last moment, in amount to give not more than 7 or 8 per cent. lactose in all. As a rule ordinary sugar can be re-introduced gradually at about 3 months of age. In older children the syndrome is generally found only when sugar consumption is excessive, but the signs may be erroneously ascribed to some more valuable food, such as eggs. Treatment with vitamin B complex may be helpful.

For some unknown reason sugar intolerance is more frequent with dried milk containing 7 to 8 per cent. sugar than with sweetened condensed milk containing 10 per cent. It is suggested that manufacturers of dried milk should produce alternative products, either unsweetened or sweetened with a mixture of sugars.—W. M. Deans.

3801

FREUDENBERG, E. Weitere Beobachtungen zur Frage der "Cystinosis". [**Further observations on cystinosis.**] *Ann. paediat.*, 1954, **182**, 85-106. [Kinderspital, Basle.] English and French summaries.

Clinical and laboratory studies of a year-old child with cystinosis, retarded growth, severe rickets, renal glycosuria and amino-aciduria are described. Deposits of tyrosine as well as cystine were detected in the bone marrow. Treatment with alkalis and choline was without effect, but daily intramuscular injections of 50 mg. adenosine phosphate cured the rickets, which had not

responded to correction of the Ca:P ratio of the diet or to vitamin D; the glycosuria disappeared and the amino-aciduria was much reduced.

W. M. Deans.

3802

PORTIS, S. A. **The treatment of liver disease.** *Med. Clin. N. Amer.*, 1953, **37**, 1139-1156. [Dept. Gastroenterol., Beverly Hills Clin., Calif.]

3803

JIMÉNEZ DÍAZ, C., PERIANES, J. and ORTEGA, A. Tratamiento de las cirrosis hepáticas con terramicina. [**Treatment of hepatic cirrhosis with terramycin.**] *Rev. clín. española*, 1953, **51**, 11-17. [Clín. Med., Hosp. Gen., Madrid.] English, German and French summaries.

A review.

3804

PORTIS, S. A. and WEINBERG, S. **Recent advances in the medical treatment of cirrhosis of the liver.** *J. Amer. Med. Assoc.*, 1952, **149**, 1265-1272. [Med. Dept., Michael Reese Hosp., Chicago, Ill.]

A lecture report.

3805

DEMEULENAERE, L. Stéatose hépatique et antibiotiques. [**Fatty liver and antibiotics.**] *Acta gastro-enterol. belg.*, 1953, **16**, 791-795. *Proc. Clin. Méd., Univ. Ghent.*

Two cases are described in which fatty liver is ascribed to prolonged use of antibiotics.

3806

HALL, E. M., OLSEN, A. Y. and DAVIS, F. E. **Portal cirrhosis. Clinical and pathologic review of 782 cases from 16,600 necropsies.** *Amer. J. Pathol.*, 1953, **29**, 993-1027. [Dept. Pathol., Sch. Med., Univ. S. California, Los Angeles.]

The development of cirrhosis was in 3 phases, the first subacute and characterised by a large fatty liver, the second subchronic with moderate to marked cirrhotic changes and moderate enlargement of the liver and the third chronic and showing characteristically an atrophic hobnail liver. Fibrosis was minimum to moderate in the subacute phase, moderate to advanced in the subchronic and generally advanced in the chronic phase. The spleen was enlarged in 60 per cent. of the cases. The incidence of coronary thrombosis in patients up to the age of 50 was half that in a control group of non-cirrhotic patients, and in the cirrhotic patients the incidence of hypertension was relatively less still. Acute or chronic infection was the commonest cause of death. The hospital

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records showed that the percentage of deaths due to cirrhosis was between 4.2 and 5.8 during the period 1941 to 1947. As the case histories were insufficient to indicate the incidence of alcoholism, a separate study was made of 100 cirrhotic patients in the same hospital. It showed that 92 of these patients were heavy drinkers and that wine and whisky were the forms of drink most frequently taken. There was a deficiency of protein in the diets of 45 and of vitamin B complex in the diets of 60 of these 100 patients.—L. Wills.

3807

ATKINSON, M., PATON, A. and SHERLOCK, S. **Control of ascites in hepatic cirrhosis.** *Lancet*, 1954, **266**, 128-131. [Postgrad. Med. Sch., London.]

Three cases are reported which show that ascites in portal cirrhosis may be controlled by restriction of Na intake in conjunction with administration of mercurial diuretics and ammonium chloride.—F. C. Aitken.

3808

DUNSTER, M. O., MCGOWAN, G. K. and BENNETT, D. **The effect of cation exchange resins in the treatment of pre-eclamptic toxæmia of pregnancy.** *J. Obstet. Gynaecol. Brit. Empire*, 1954, **61**, 31-45. [Dept. Obstet. Gynaecol., United Bristol Hosps.]

Seven cases of pre-eclampsia were treated with "Resodec", a cross-linked polyacrylic polycarboxyl cation exchange resin of which 77 per cent. is combined with ammonia and 23 per cent. with K, usually in doses of 30 g. thrice daily for 3 days, then with half this dose. The clinical details in each case are described. It is concluded that the treatment, combined with a diet low in Na, is effective in diminishing water retention and is beneficial in permitting continuance of pregnancy in severe cases of pre-eclampsia.—A. M. Thomson.

3809

TENNEY, B. **Hypertension in pregnancy.** *New Engl. J. Med.*, 1953, **249**, 1108-1115. [Dept. Obstet. Gynaecol., Sch. Med., Univ. Boston, Mass.]

The diagnosis and treatment of renal disease, essential hypertension, pre-eclamptic toxæmia and eclampsia are described. The principal feature of diet treatment is restriction of Na intake.

F. C. Aitken.

3810

VIVANCO, F. and DE LA BARREDA, P. **Resultados prácticos del tratamiento dietético de la hipertensión arterial. [Practical results of dietary treatment of arterial hypertension.]** *Rev. española Enferm. Apar. digest. Nutricion*, Vol. 24, No. 3

1953, **12**, 570-580. [Inst. Nac. Nutric., Inst. Invest. Med., Madrid.] French and English summaries.

3811

HUTCHINSON, D. L. and PLENTL, A. A. **Investigations on the use of sodium-removing resins in the treatment of pre-eclampsia.** *Amer. J. Obstet. Gynecol.*, 1954, **67**, 32-46. [Dept. Obstet. Gynaecol., Coll. Phys. Surg., Columbia Univ., New York.]

Studies were made on 4 patients with pre-eclampsia, and less systematic trials on 3 others. After preliminary treatment by rest, low-salt diet, mild sedatives and NH_4Cl , they were given "Carbo-Resin" in maximum amounts, usually about 72 g. daily in 3 doses. When urinary Na output and serum CO_2 combining power began to decrease, resin was discontinued. The most consistent result was a fall in urinary Na output from between 40 and 105 to less than 5 m. equiv. daily. Total body water decreased roughly in proportion to bodyweight, but the reduction was exceeded both relatively and absolutely by decline in the Na space. The reduction of body Na was most significant when expressed as m. equiv. per kg. bodyweight. Serum Na and K concentrations remained within normal limits. A significant fall in the CO_2 combining power of serum, with normal serum chlorides and blood pH, occurred at the height of the therapeutic effect of the resin. Plasma volume decreased slightly. The resin had no consistent effect on proteinuria or blood pressure, but they did not increase. In the control of resin therapy, estimation of serum CO_2 combining power was the only laboratory test required.—A. M. Thomson.

3812

LANE, H. S., COLLIN, H. A., DARO, A. F. and NORA, E. (Jr.) **Hypokalemia due to persistent vomiting during pregnancy.** *J. Amer. Med. Assoc.*, 1953, **153**, 1012-1017. [Dept. Surg., Cook County Hosp., Chicago, Ill.]

In 8 cases of severe vomiting of pregnancy accompanied by weight loss, serum K was below 3.4 m. equiv. per litre. Blood chemistry data tabulated include K, Na, Cl, CO_2 combining power, N.P.N. and creatinine. Detailed notes of 3 cases are given. Treatment with parenteral K "resulted in a striking improvement in mental attitude and muscular strength. In several cases, this appeared to be a lifesaving procedure."

A. M. Thomson.

3813

ULICH, K. and WOLF, W. **Über den Kochsalz- und Natriumgehalt der "salzfreien" Krankenkost.** [Sodium chloride and sodium content

of "salt-free" invalid diet.] *Deutsch. med. Wochenschr.*, 1954, **79**, 108-110. [Pharmakol. Inst., Freie Univ. Berlin.]

It is considered that the diet for patients with oedema under treatment with cation exchange resins should not contain more than 800 mg. Na or 2 g. salt daily.

The results of Na estimations by flame photometer in some 50 foods, from manufacturers of special foods and all described as "low-salt" or "salt-free", are tabulated along with the calculated NaCl contents. Sausages and other meat products mostly contained from 0.3 to 0.9 per cent. Na; 2 samples of bread had over 0.4 per cent. and some kinds of cheese and other spreads (but not nut spreads) had over 0.3 per cent. In a few samples Cl was estimated also and the NaCl contents calculated were so low that other salts of Na must have been present. Since in Germany the salt content of foods is almost always computed from estimations of Cl, the results may be highly misleading, and it is contended that firms should be forced to declare the Na content of their products.

Finally, some hints are given on the planning of a diet with some variety and supplying not more than 800 mg. Na. The most important item is salt-free bread. For breakfast the patient can have an egg, with salt-free rolls, unsalted butter, and jam; for the mid-day meal meat, potatoes, vegetables, pudding and fruit; for supper bread, butter, curds, meat, fruit. If the diet is genuinely low in Na, the fluid intake need not be restricted.

W. M. Deans.

3814

MITCHELL, G. W. (Jr.) and ROGERS, J. **The influence of weight reduction on amenorrhea in obese women.** *New Engl. J. Med.*, 1953, **249**, 835-837. [Pratt Diagnostic Clin., New England Centre Hosp., Boston, Mass.]

When 32 obese women with amenorrhoea unaccounted for by pelvic disorder or systemic disease were treated with a 1200-Cal. diet, 13 lost weight and began to menstruate again, 15 did neither, 2 lost weight without return of menstruation and 2 menstruated but did not lose weight. In several, menstruation began before much weight had been lost. It is suggested that decreasing bodyweight rather than absolute loss of bodyweight had a favourable effect, or that some emotional factor was responsible for both the obesity and the amenorrhoea.—W. M. Deans.

3815

SERANTES, N. A. **Dietoterapia de la obesidad durante el embarazo.** [Diet treatment of obesity in pregnancy.] *Rev. Asoc. argent. Dietologia*, 1953, **11**, 23-31.

A lecture.

3816

SHELDON, J. H. **The clinical spectrum of obesity.** *Brit. Med. J.*, 1953, ii, 1402-1404. [Dept. Phys., Royal Hosp., Wolverhampton.]

3817

SINCLAIR, H. M. **Assessment and results of obesity.** *Brit. Med. J.*, 1953, ii, 1404-1407. [Lab. Human Nutrit., Univ. Oxford.]

3818

MODI, C. J. **Obesity—a psychosomatic disease.** *Antiseptic*, 1953, **50**, 798-800. [9 Juhu Rd., Vile Parle, Bombay 24.]

3819

FINZI, M. **Dietetica preventiva e terapeutica dell'arteriosclerosi.** [Diets for the prevention and treatment of arteriosclerosis.] *Acta gerontol.*, 1953, **3**, 29-35. [Bologna.]

3820

GUAITA, H. E. **Dietoterapia de las afecciones de las vias biliares.** [Diet treatment of diseases of the bile ducts.] *Rev. Asoc. argent. Dietologia*, 1953, **11**, 3-22.

A lecture.

3821

FASSO, E. **Les dyscalcies d'origine hépato-digestive.** [Calcium deficiency of hepato-digestive origin.] *Presse méd.*, 1954, **62**, 247-249. [Montpellier.]

3822

SIMPSON, J. A. **Dermatological changes in hypocalcaemia.** *Brit. J. Dermatol.*, 1954, **66**, 1-15. [Gardiner Inst. Med., Univ. Glasgow.]

The skin, nail and hair changes found in 5 patients with hypoparathyroidism are described. In this condition low blood Ca occurs without other sign of deficiency. In 29 patients with steatorrhoea, 2 of whom are described in detail, skin changes similar to those of hypoparathyroidism were seen. Since multiple deficiencies occur in steatorrhoea, the skin changes cannot be definitely attributed to Ca deficiency, although in some serum Ca levels as low as 7.0 mg. per 100 ml. and bone changes indicative of prolonged Ca deficiency were found. From a study of these cases and of others from the literature it is suggested that the dermatological changes associated with low blood Ca are alopecia, with transverse grooving of the nails and oedema due to angiospasm, dry scaly pigmented skin with scanty hair growth, and onychorrhexis and secondary mycotic infections of the nails. The problem of *impetigo herpetiformis* and the possibility of a specific skin lesion in idiopathic hypoparathyroidism are discussed.—M. B. Richards.

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3823

MOEHLIG, R. C. and STEINBACH, A. L. **Cortisone interference with calcium therapy in hypoparathyroidism.** *J. Amer. Med. Assoc.*, 1954, **154**, 42-44. [Dept. Med., Harper Hosp., Detroit, Mich.]

Clinical observations on 4 patients indicated that effective Ca therapy was not possible during cortisone administration.

It is suggested that when there is a risk of tetany owing to hypoparathyroidism, ulcerative colitis with poor Ca absorption or a low serum protein level with low serum Ca, cortisone may increase that risk.—B. W. Simpson.

3824

DE TONI, G. Un nouveau syndrome dysmétabolique et dysendocrine : acidose rénale idiopathique avec néphrocalcinose et pseudo-paralyse hypopotassiémique; nanisme; rachisme tardif; dystrophie adiposo-génitale. [A new syndrome of metabolic and endocrine disorders: idiopathic renal acidosis with renal calcium deposits and pseudo-paralysis with low blood potassium; dwarfing; late rickets; adiposo-genital dystrophy.] *Ann. paediat.*, 1954, **182**, 63-76. [Inst. Clin. Pédiat., Univ. Genoa.] English and German summaries.

Treatment with 50 to 100 ml. daily of a mixture of 140 g. citric acid and 98 g. sodium citrate per litre gave a return towards normal of the alkali reserve, recovery of muscle strength and resumption of growth.—I. Leitch.

3825

MAUTNER, H. **The pathologic anatomy and physiology of mental retardation.** *Ann. paediat.*, 1954, **182**, 76-84. [Wrentham State Sch., Wrentham, Mass.] German and French summaries.

Recent research suggests that not the frontal lobe nor the cortex in particular is the seat of intelligence; the thalamus may be more important. Damaged areas such as occur in epileptics may affect the functioning of other areas.

Mental abnormalities are associated with abnormalities of metabolism. Acetylcholine, the enzymes cholinesterase and choline acetylase, and

adenosinetriphosphate, with glutamic acid, are concerned in mental activity. Lack of oxygen or of carbohydrate retards activity.

Patients with certain types of metabolic abnormality, e.g., phenylpyruvic oligophrenia, show low oxygen consumption, which may be attributed to either failure of development or destruction of respiratory enzymes. Phenylpyruvic oligophrenics lack the power to convert phenylalanine to tyrosine. The presence of an antagonist has been postulated but not proved. Phenylalanine itself may be a poison. Other amino-acids may be involved in disturbances in this, or related, abnormalities.

Several lipid storage diseases produce mental deterioration and ultimately idiocy.

Carbohydrate is the essential fuel. There is no mental disturbance in diabetes, but somnolence or unconsciousness is characteristic of, e.g. adenoma of the pancreas, with low blood sugar. Glycogen storage disease produces mild mental retardation.

The mental changes in cretinism may be due to defective oxidation or may be related to abnormal protein metabolism.—I. Leitch.

3826

GETZ, H. R. **Problems in feeding the tuberculous patient.** *J. Amer. Dietetic Assoc.*, 1954, **30**, 17-20. [Charles Cook Hastings Home, Altadena, Calif.]

3827

LEWIS, S. M. and LURIE, A. **Onyalai. A clinical and laboratory survey.** *J. Trop. Med. Hyg.*, 1953, **56**, 281-289. [S. African Inst. Med. Res., Johannesburg.]

Findings are reported in detail on blood and bone marrow from 32 patients, 31 of whom were Africans and 1 a European woman. They are considered to be classifiable as idiopathic thrombocytopenia in either acute or chronic form. Of the vitamins tested in treatment vitamin C was used most frequently but, contrary to the work of Strangway and Strangway (Abst. 2707, Vol. 19), there was no evidence that it or any of the other vitamins A, B, K or P which were tried had any effect on the course of the disease.—D. Harvey.

See also Absts. 3283, 3297, 3397, 3622, 3623, 3634, 3686, 3687, 3712.

6. FEEDING OF ANIMALS

GENERAL, INCLUDING DIGESTIBILITY TRIALS

3828

THOMPSON, A. **Pasturage as a source of minerals.** *Agric. Progress*, 1953, **28**, 52-67. [Sch. Agric., King's Coll., Newcastle upon Tyne.]

A review.

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3829

BARKER, A. S. and FERGUSON, W. S. **The contribution of grazing to the nutrition of farm animals.** *Proc. Nutrition Soc.*, 1954, **13**, 6-10. [Jealott's Hill Res. Stat., Bracknell, Berks.]

3830

- LOUW, J. G. **Trace elements in the nutrition of ruminants.** *Farming in S. Africa*, 1953, **28**, 411-414. [Div. Vet. Serv., Onderstepoort.]

3831

- CARPENTER, K. J. **The relative values of available protein concentrates for non-ruminants.** *Proc. Nutrition Soc.*, 1954, **13**, 23-27. [Rowett Res. Inst., Bucksburn, Aberdeenshire.]

3832

- UNDERWOOD, E. J. and MOIR, R. J. **Aspects of protein nutrition in animals.** *J. Austral. Inst. Agric. Sci.*, 1953, **19**, 214-221. [Inst. Agric., Univ. W. Australia.]

3833

- MÜLLER, W., SCHÜRCH, A. and CRASEMANN, E. **Die Brauchbarkeit von Indikatormethoden bei Verdauungsversuchen am Geflügel. [Use of the indicator method in digestibility experiments with poultry.]** *Schweiz. landwirtsch. Monatsh.*, 1954, **32**, 8-13. [Inst. Haustierernährung, Eidg. Tech. Hochsch., Zürich.]

Of the 3 indicators tested, barium sulphate and lignin were rejected because of analytical difficulties with the former and the fact that the lignin excreted in the faeces was not identical in character with that in the feed. Chromium oxide, with the analytical method of Schürch *et al.* (Abst. 3204, Vol. 20), was found to be satisfactory, provided an aliquot of the total day and night faeces was analysed. The results agreed well with those obtained by the standard method.

W. Godden.

3834

- RAYMOND, W. F., HARRIS, C. E. and HARKER, V. G. **Studies on the digestibility of herbage. 1. Technique of measurement of digestibility and some observations on factors affecting the accuracy of digestibility data. 2. Effect of freezing and cold storage of herbage on its digestibility by sheep.** *J. Brit. Grassland Soc.*, 1953, **8**, 301-314; 315-320. [Grassland Res. Stat., Drayton, Stratford on Avon.]

1. The technique of digestibility experiments with sheep grazing outdoors, or fed indoors in metabolism crates with grass stored at 0° F., is described. Faeces collection bags were used in both indoor and outdoor experiments. Methods of analysis for dry matter, N, "crude fibre" and "chromogen" on a cream of wet faeces are discussed. Studies of the optimum length of the collection period and the number of sheep required to detect differences in digestibility were made.

2. Experiments to test whether herbage given after cold storage at 0° F. had the same digestibility as it would have had if fresh are described.

There was no significant effect of freezing on the digestibility of organic matter, dry matter or N. An apparent difference was explained by a change in the digestive abilities of the sheep over the 50-day experimental period.—D. M. Walker.

3835

- MILLER, W. J., WAUGH, R. K. and MATRONE, G. **Comparison of the digestibility of certain pasture forages in the fresh and dried states.** *J. Animal Sci.*, 1954, **13**, 283-288. [Dept. Animal Indust., N. Carolina Agric. Exp. Stat., Raleigh.]

The digestibility by rabbits of lignin and of the proximate nutrients in ladino clover, tall fescue and orchard grass was estimated with fresh and dried material. Drying at 55° to 60° C. depressed the digestibility of protein and lignin in all 3 species. The digestibility of crude fibre and of N-free extract in the clover was depressed by drying, but in the grasses the digestibility of these nutrients was higher in the dried material than in the fresh forage. The digestibility of all proximate nutrients and of lignin was higher in the clover than in the grasses. The lignin in the fresh ladino clover was digested to 26.4 per cent. compared with 6.0 and 9.1 per cent. for tall fescue and orchard grass, respectively.—D. M. Walker.

3836

- DHARMANI, L. C. and KARIRA, G. V. **Maize cake as a cattle feed.** *Indian J. Vet. Sci.*, 1953, **23**, 123-127. [Dept. Agric. Punjab, Ludhiana.]

The digestibility of maize cake made from maize bran and molasses in the Punjab was estimated with 6 Sahiwal heifers. The results were compared with those for cottonseed cake, *sarson* cake and *toria* cake. Chemical analysis showed the maize cake to be richer in fat (19.8 per cent.) and N-free extract (43.1 per cent.) and poorer in protein (19.5 per cent.) than the other cakes. The fat was slightly more and the protein slightly less digestible than that of *sarson* or *toria* cake. Giving green berseem with the maize cake to make it more acceptable to the cattle improved the digestibility of fat from 87 to 98 per cent. and of protein from 64 to 70 per cent., but had little effect on the digestibility of the dry matter or N-free extract. There was no ill effect from the high fat content of the maize cake. The suitability of the cake for storage is being investigated.—T. D. Bell.

3837

- DAVIDSON, W. M. and KENNEDY, J. W. **Digestibility studies with swine. 7. Gross energy values and ether extract determinations.** *Canad. J. Agric. Sci.*, 1953, **33**, 611-614. [Div. Chem., Sci. Serv., Dept. Agric., Ottawa.]

In previous work with pigs Watson *et al.* (Abst.

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5977, Vol. 20) found that the inclusion of 30 per cent. tankage in a barley ration raised the apparent digestibility of the ether extract contributed by barley from 58 to 90 per cent. In further trials with 6 similar pigs in which the digestibility of 2 vegetable protein and 3 animal protein supplements in a barley ration was estimated, it was shown that the gross digestible energy values calculated from the composition of food and faeces depended on the method used for the estimation of fat in the food and faeces. Gross digestible energy values, particularly for tankage and meatmeal, obtained by calculation, using the results for fat obtained by the acid hydrolysis method of Wood and Simpson (Abst. 3134, Vol. 4), were in much closer agreement with those obtained by the bomb calorimeter than were those obtained with the results for fat from straight extraction with light petroleum. The difference in values obtained by the two methods for faecal fat is partly correlated with the Ca content of the faeces, but this is not the sole cause.—W. Godden.

3838

BRUNE, H. Fehlernährung mit Rübenblattsilage und Troblako. Experimenteller Rübenblatt-durchfall beim Hammel unter Berücksichtigung von Adsorbentienbeifütterung. 1. Die organische Substanz des Futters. [Unsuccessful use of beet leaf silage and Troblako. Experimental diarrhoea due to beet leaves in wethers with reference to the simultaneous feeding of adsorbents. 1. The organic matter of the ration.] *Arch. Tierernährung*, 1953, 3, 281–312. [Inst. Tierphysiol., Univ. Göttingen.]

Digestibility trials over a period of 2 years were made with 4 sheep in which beet leaf silage or Troblako was given alone or with the addition of 150 g. oat straw, 45 or 100 g. heavy kaolin (*bolus alba*), 50 g. activated charcoal, 56.5 g. cellulose, 30 g. chalk, 2 or 4 g. cholesterol or 4 g. of a crude ether extract of hay.

The single beet leaf products, without supplements, led to "beet leaf diarrhoea". Changes were noted in the percentage dry matter in the faeces which were related to some extent to the supplements and to the duration of the experimental period. *Bolus alba* caused a change in the physical condition of the faeces and 100 g. daily reduced the digestibility of the organic matter of the ration. The amount of carotene in the faeces decreased when *bolus alba* or CaCO_3 was given as a supplement to Troblako (cf. Abst. 2838, Vol. 23). The addition of 2 or 4 g. cholesterol daily to either of the single feeds raised the percentage dry matter in the faeces. Crude ether extract from hay, 4 g. daily, exercised a regulatory effect on the physical state of the faeces. Prolonged feeding of either beet leaf product caused a drop in serum

cholesterol, which quickly rose again when cholesterol was given as a supplement. The amount of unsaponifiable matter in the faecal fat changed with the percentage solids in the faeces as affected by the cholesterol supplement. The percentage of oxalic acid in the feed excreted in the faeces decreased after about 20 days on beet leaf to about 75 per cent. and remained fairly constant regardless of the supplement given. The Ca balances were in general negative throughout the experimental period. The N balances were positive except on 3 occasions.—W. Godden.

3839

DIJKSTRA, N. D. De verteerbaarheid en voederwaarde van bieten. [The digestibility and feed value of fodder beet.] *Versl. Landbouwk. Onderzoek.*, 1953, No. 59.7, pp. 16. [Rijkslandbouwproefstat., Hoorn.] English summary.

Earlier data are summarised. Four varieties of beet, two of them grown on different soils, were tested in experiments with 3 wethers given 200 g. dried grass or hay of high quality and amounts of beet equivalent in terms of dry matter (DM). In the 6 samples tested DM rose from 11.5 to 23.0 per cent. and as a percentage of DM, crude protein fell from 7.6 to 5.7, true protein from 3.6 to 3.1 and crude fibre from 7.0 to 5.5. Digestibility varied little. The coefficients were for DM 87 to 90, organic matter 90 to 93, carbohydrates (other than fibre) 95, fibre on the average 83.5, amides 95, but true protein only 12 to 34. Digestibility of crude protein increased with percentage crude protein in DM. Kellner's value of 72 is used to compute starch equivalent, which differed little from 60 in DM and increased from about 7 to 14 in fresh roots as DM rose.—I. Leitch.

3840

GALLUP, W. D., POPE, L. S. and WHITEHAIR, C. K. Urea as a source of protein in livestock rations. *Oklahoma Agric. Exp. Stat. Circ.* No. C-137, October 1953, pp. 10. [Oklahoma Agric. and Mech. Coll., Stillwater.]

The use of urea as a protein extender in livestock rations is discussed. The results of feeding trials are summarised.

With fattening calves, full-fed on grain, pelleted protein supplements in which urea supplied the equivalent of 25 or 50 per cent. of the protein were as good as plant protein supplements. When urea supplied the equivalent of 85 per cent. of the protein results were unsatisfactory. A 25 per cent. urea pellet was a satisfactory supplement to dried grass for wintering yearling heifers, 2-year-old steers and mature beef cows.

Metabolism trials with sheep showed that they could utilise urea nitrogen as a substitute for

protein, but in fattening rations for lambs urea could not replace the protein. Urea could replace one-third of the protein in rations for pregnant and lactating ewes without detrimental effect on gains, fleece weight or weight of lambs.

Low-protein roughages were not satisfactorily supplemented unless a carbohydrate concentrate was also included.

Ca, P and vitamin A metabolism of sheep was not affected by the feeding of urea. Small amounts of methionine increased the value of urea in sheep rations.

(The experiments are summarised from *Oklahoma Agric. Exp. Stat. Bull.* No. B-409.)—T. D. Bell.

3841

KROSBY, P. and ULVESLI, O. Et forsøk til belysning av fôrmargkalens verdi. [**Feeding value of marrowstem kale.**] *Tidsskr. norske Landbruk*, 1953, **60**, 335–346. [Statens Frøkontroll, Ås.] English summary.

Marrowstem kale can be sown, thinned, kept clean and harvested by machine. It can be harvested as required or ensiled. Thinned kale contains less dry matter but more protein, crude and true, and less fibre than unthinned. It contains from 11.5 to 16.7 per cent. dry matter, 9.1 to 15.7 per cent. crude protein and 18.0 to 23.0 per cent. fibre. Digestibility coefficients with wethers were, per cent.: dry matter 76, crude protein 75, fibre 52 for unthinned and, in the same order, 79, 81 and 57 for thinned kale. With heavy manuring, the unthinned crop yields about 15 per cent. more feed units per unit area than the thinned but 8 per cent. less digestible crude protein: less heavily manured, a thinned crop gives 5 per cent. more feed units and 24 per cent. more digestible crude protein.—I. Leitch.

3842

ŠKORPÍK, P. and SEDLÁČEK, J. Stanovení krmné hodnoty pokrutin z jader peckovitého ovoce. [**The nutritive value of kernel cakes from stone fruits.**] *Sborn. čsl. Akad. Zěměd.*, 1954, **27**, 39–52. Russian and German summaries.

Kernel cakes from stone fruit cannot be used to replace the whole of the protein concentrates in rations for fattening pigs. If this is done the ration becomes unpalatable, the animals go off their food and the utilisation of what is eaten is reduced. It is probable that these cakes could be used if introduced gradually, mixed with the other concentrates and not allowed to exceed 350 to 400 g. per head daily. The cakes can also be used in limited amounts in a concentrate mixture for cattle. Sheep will tolerate a ration containing 750 g. of these cakes per head daily without showing any distaste or suffering in health.

The cakes vary in composition and nutritive

value according to the material from which they are made. Their economic importance in possibly saving the import of protein-rich foods is discussed. [From summary.]—W. Godden.

3843

ISAJEV, F. Získávání náhradních druhů krmiv za současné situace. [**Substitute forages.**] *Veterinářství*, 1953, **3**, No. 5, 107–108. [Res. Inst. Animal Prod., Uhřetěves, Prague.]

For pigs and cattle small amounts of brewer's yeast, with a content of 7 per cent. digestible protein, may be used. Whey may be given in large amounts. Preparations from claws, hoofs, horns and feathers, and of the pancreas after the production of insulin, contain large amounts of amino-acids. Waste from bakeries, factories for sweets and flour products, and mills may be used for larger pigs and cattle after boiling. Waste after the cleaning of clover seed contains up to 19 per cent. digestible protein.

Ant. Jančařík (Czechoslovakia).

3844

CLEGG, M. T. and COLE, H. H. **The action of stilboestrol on the growth response in ruminants.** *J. Animal Sci.*, 1954, **13**, 108–130. [Dept. Animal Husb., Univ. California, Davis.]

Yearling Hereford heifers and 2-year-old steers and Hampshire lambs were used in a series of 12 experiments to determine the effects of stilboestrol implants on rate of gain, economy of feed utilisation, endocrine weights, growth and adrenocorticotrophic hormone content of the pituitary, gland histology, N retention and differential blood counts. In all 340 animals were treated and a corresponding number were used as controls. The cattle received implants of 60 or 120 mg. stilboestrol and the lambs 12 or 24 mg. In the different experiments the diets were varied so that some animals were maintained on irrigated pasture with or without supplements and others on hay and concentrates indoors.

Supplemented stilboestrol-treated steers and heifers on pasture and in the feed lot made greater gains than controls or treated steers on pasture alone. The growth response of treated heifers was not so marked as that of steers. Weight gains of castrated male and intact female lambs exceeded those of the controls. Rate of gain of ewe lambs given 24 mg. stilboestrol was less than that of lambs given only 12 mg. Treated steers and heifers consumed more feed and utilised it more efficiently than did the controls. A further improvement in efficiency of feed utilisation was obtained when an additional 60 mg. stilboestrol was implanted 66 days after the first treatment. N retention in steers increased after treatment. A comparison of the carcasses showed that a greater percentage

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of the higher carcase grades was found among the untreated steers, heifers and ewe lambs.

The weights of the pituitary and adrenal glands were significantly greater than those of the controls. In treated heifers thyroid weights were depressed. The amount of growth hormone present in the pituitaries of treated heifers was about twice that in the controls.—J. N. Aitken.

3845

HENNAUX, L., HOLVOET, J., LECOMTE, R. and HENIUS, J. M. Les agents modificateurs de la fonction thyroïdienne et l'engraissement des animaux domestiques. [**Agents affecting thyroid function and the fattening of domestic animals.**] *Bull. Inst. agronom. Gembloux*, 1953, **21**, 58–88.

Five experiments were made with pigs, 2 with cockerels and 1 with sheep to investigate the effects of adding antithyroid and thyroid compounds as supplements to basal rations. Theoretically antithyroid compounds should favour fattening and iodinated compounds should favour growth. An experiment in which pigs at a weight of 50 kg. had iodinated casein, 0.066 or 0.132 per cent. of the ration, for 3 weeks and then 0.2 per cent. methylthiouracil for 8 days produced carcasses with a better commercial value than controls; the carcasses of pigs given antithyroid compounds only were not so good as the controls. Propylthiouracil administered to 10-week-old chickens at a level of 0.05 and 0.15 per cent. for 4 weeks favoured fattening, improved market value, reduced consumption index and retarded testicular activity. The combination of stilboestrol with thiouracil gave even better results. One single experiment with 4 adult male castrated sheep which were given 1.4 g. methylthiouracil daily showed that this dose added to the specified ration favoured fattening and gave a good carcase.

It is emphasised that care should be taken before adopting a regime of thyroid and antithyroid administration. In pigs the results with antithyroid compounds were not good, with cockerels the results were favourable and with sheep the result was promising.—B. W. Simpson.

3846

STOB, M., ANDREWS, F. N., ZARROW, M. X. and BEESON, W. M. **Estrogenic activity of the meat of cattle, sheep and poultry following treatment with synthetic estrogens and progesterone.** *J. Animal Sci.*, 1954, **13**, 138–151. [Dept. Animal Husb., Agric. Exp. Stat., Purdue Univ., Lafayette, Ind.]

Cattle, sheep and chickens were treated with synthetic oestrogens or progesterone, and tissues were assayed for oestrogenic activity.

In cattle with 60 or 120 mg. stilboestrol or 80

mg. dienoestrol subcutaneously implanted 140 days before slaughter, only the higher level of stilboestrol caused oestrogenic activity in the muscle. In liver from all treated animals oestrogenic activity was found. In another trial, in which treatment was with 108 mg. stilboestrol, 120 mg. dienoestrol or 300 mg. progesterone, oestrogenic activity was found in all samples of muscle. Cooking did not reduce the activity.

After treatment with 12 mg. stilboestrol 70 days before slaughter, there was oestrogenic activity in the muscle, but not in the liver, of lambs. In a second trial lambs were implanted with 12 or 24 mg. stilboestrol in the neck, ear or scrotum, and slaughtered 4, 8 or 12 weeks after treatment. At the lower level there was oestrogenic activity in the muscle, but only after 12 weeks. With 24 mg. stilboestrol there was activity in the muscle after 4 and 12 weeks but not after 8 weeks. There was no relation between the site of implantation and the amount of residual hormone.

Chickens were given implants of 12-mg. pellets of stilboestrol and whole carcasses were assayed 1, 2, 3 or 4 weeks after treatment. There was considerable retention of the hormone, but, in contrast to sheep, this was greatly reduced with time. Since the whole carcasses were used, some of the stilboestrol detected may not have been absorbed.

It was calculated that the residual hormone would not exceed 0.01 μ g. per g. dried tissue, which would probably be safe for human consumption.

T. D. Bell.

3847

STOKSTAD, E. L. R. **Antibiotics in animal nutrition.** *Physiol. Rev.*, 1954, **34**, 25–51. [Lederle Labs. Div., American Cyanamid Co., Pearl River, N.Y.]

3848

DEGENER, W. Betrachtungen über den nutritiven Wirkungsmechanismus von Antibiotika. [**Mechanism of the effect of antibiotics on nutrition.**] *Arch. Tierernährung*, 1953, **3**, 313–323. [Cela GmbH., Ingelheim (Rhein).]

A review.

3849

REID, J. T., WARNER, R. G. and LOOSLI, J. K. **Antibiotics in the nutrition of ruminants.** *J. Agric. Food Chem.*, 1954, **2**, 186–192. [Cornell Univ., Ithaca, N.Y.]

A review.

3850

TAYLOR, M. W. **The grasslands of the United States.** *J. Brit. Grassland Soc.*, 1953, **8**, 321–336. [Brit. Embassy, Washington.]

About 55 per cent. of the land area of the United States, 1905 million acres, is devoted to

some sort of grass production and provides nearly half the feed for all livestock. About one-third is publicly owned and is rented to farmers through government agencies.

This paper deals with 7 geographical regions in turn and describes briefly the soils, climate and types of grassland and the systems of management encountered within each area.—P. C. Jowsey.

3851

MOORE, H. I. and CRADDOCK-TURNBULL, J. N. **Silage for winter feeding.** *Agriculture, J. Minist. Agric. Engl.*, 1954, **60**, 458–462. [Seale-Hayne Agric. Coll.]

Over the past 5 years the Seal-Hayne College Farm has attained a high degree of self-sufficiency. This is largely due to the use of arable crop and grass silage, which supplies 38 per cent. of the starch equivalent and 45 per cent. of the protein equivalent for cattle and 28 and 32 per cent. for sheep. Potato silage is given to pigs. Typical examples of the rations are shown. Silage for winter feeding has proved economical and animal production is maintained at a high level.

T. D. Bell.

3852

FERRARI, E. Gli sprechi nell'alimentazione del bestiame. [**Wastage in animal feeding.**] *Riv. Zootec.*, 1954, **27**, 47–49.

The three most common causes of waste in animal feeding are insufficient preparation of roughages and grain, unbalanced rations and feeding beyond requirements. Hay and straw should be chopped, grains crushed or ground and roots cooked. Cooking protein concentrates reduces digestibility. The nutritive ratio of the ration should be related to the requirements of the stock, and the same applies to the amounts given, particularly as regards dairy cattle and their milk yield. Due consideration of these points would greatly reduce wastage and economic loss.—T. D. Bell.

3853

DEPARTMENT OF AGRICULTURE FOR SCOTLAND, THE SCOTTISH HILL FARM RESEARCH COMMITTEE. **Hill farm research. Second report.** H.M.S.O., Edinburgh, 1953, pp. 108. Price 3s. 6d. net.

This committee was concerned with all aspects of hill farming, including vegetation on the hills and adjacent low ground, problems encountered in the management of sheep and cattle and the interrelationship of these animals under hill grazing conditions, economic studies, drainage and afforestation problems. With regard to heather, special emphasis is placed on the ecological survey at present in progress, and recommendations include field experiments when they become practicable as part of a programme for the study of moorland management and for increasing information on nutritional requirements of different breeds of hill sheep. In discussing mineral deficiency it is suggested that the extent of cobalt deficiency may be greater than is realised and attention should be paid to clinical surveys and experiments with cobalt on a large scale. Aerial topdressing and reseedling are discussed chiefly in the light of New Zealand experience, but no recommendation is made. Recommendations include the appointment of a scientific officer to direct hill farming research and promote the co-operation of specialist scientific workers at agricultural colleges, university departments and research institutes on the 3 hill farm research stations at present administered by the agricultural colleges. A brief study was also made of Welsh hill farming conditions. There are useful tables of hill sheep distribution and a list of hill plants with their botanical names and the English, Gaelic and Welsh equivalents.

W. Thomson.

3854

FENTON, E. W. **An outline of the influence of man and animals on the vegetation of certain hill grazings in south-east Scotland.** *Agric. Progress*, 1953, **28**, 71–75. [Edinburgh and East of Scotland Coll. Agric.]

3855

FERRARI, E. Per la migliore utilizzazione di foraggi e mangimi. [**Better utilisation of forage and fodder.**] *Riv. Zootec.*, 1954, **27**, 10–11.

3856

GRIFFITHS, R. L. **Fodder conservation for farm livestock.** *J. Dept. Agric. S. Austral.*, 1953, **57**, 149–152; 155.

3857

TSYNKOV, M. YU. [**Correct combination of agriculture and animal husbandry on collective farms.**] *Sovet. Zootec.*, 1952, No. 12, 89.

3858

MANDON, A. L'Adamawa, terre d'élevage. [**The Adamawa (French Cameroons), stock rearing area.**] *Rev. Élevage Méd. vét. Pays trop.*, 1953, **6**, 77–89.

3859

EDEN, A. **The role of the nutrition adviser in livestock production.** *Proc. Nutrition Soc.*, 1954, **13**, 37–40. [Minist. Agric. Fish. Nat. Agric. Advisory Serv., Anstey Hall, Trumpington, Cambridge.]

See also Absts. 2940–42, 2994, 3383, 3431, 3965, 4017.

CATTLE

GROWTH AND FATTENING

3860

HIBBS, J. W., CONRAD, H. R. and POUNDEN, W. D.

A high roughage system for raising calves based on the early development of rumen function.**2. Growth, feed consumption, and utilization by calves fed a 3 : 2 ratio of hay to grain with or without molasses or penicillin supplement.**CONRAD, H. R. and HIBBS, J. W. **3. Effect of rumen inoculations and the ratio of hay to grain on digestion and nitrogen retention.** *J. Dairy Sci.*, 1953, **36**, 1319-1325 ; 1326-1334. [Ohio Agric. Exp. Stat., Wooster.]

2. The high-roughage system used has already been described (see Abst. 1266, Vol. 24).

In this study the growth of 3 male and 3 female Jersey and Holstein calves fed on hay and grain in the ratio 3 : 2 was compared with the Ragsdale standards. The effect of adding either molasses or penicillin to this ration was also studied on 18 Jersey calves. Feed intake, height at withers and bodyweights were recorded during the first 12 weeks.

A further comparison was made between Jersey and Holstein calves given the 3 : 2 hay-grain ration to 12 weeks of age and subsequently a 2 : 1 ration of hay and grain to 26 weeks of age. All calves were given whole milk to 7 weeks of age and a grass-legume hay and a grain concentrate mixture thereafter. The calves were inoculated with rumen micro-organisms as previously described.

The growth of all calves at 12 weeks of age and of those maintained to 26 weeks of age was slightly below Ragsdale standards. The addition of molasses or penicillin to the 3 : 2 hay-grain ration had no significant effect on growth, feed consumption, or efficiency of feed utilisation. No difference in efficiency of feed utilisation was noted between the Jerseys and Holsteins during either of the periods.

3. Jersey bull calves, which had been reared on modifications of the high-roughage system already described, were used. The digestibility of dry matter, protein and cellulose and nitrogen retention in 2 eud-inoculated and 2 uninoculated calves and in calves given different types of hay-grain rations with the ratios of hay to grain 4 : 1, 3 : 2, and 2 : 3 were investigated.

The digestibility of protein was increased in inoculated calves given low-protein rations or when the protein source was mainly alfalfa hay. Nitrogen retention was not affected by rumen inoculation.

Differences in the digestion of protein by inoculated and uninoculated calves were eliminated

when the ratio of hay to grain was changed from 4 : 1 to 3 : 2 or 2 : 3. When alfalfa hay or clover-timothy hay was given in a 4 : 1 ratio, N retention per 100 lb. bodyweight decreased. There was an increase in N retention when the ratios of both hays were changed to 3 : 2 or 2 : 3.

Cellulose digestion decreased when the 2 : 3 ratio of hay to gain was compared with the 3 : 2 or 4 : 1 ratio.

The implications of the results are discussed in relation to rumen physiology.—J. N. Aitken.

3861

MANELLI, L. **Sull'allevamento delle vitelle e delle manzette. [Rearing of calves and heifers.]** *Zootec. Vet.*, 1954, **9**, 57-59. [Az. Agric. Cascina Bella.] English summary.

Whole and skimmed milk and a commercial milk powder for rearing calves for the first year of life were compared. Groups of 6 calves were reared from birth to 12 months.

The first group had whole milk, rising to a maximum of 10 litres daily, for the first 3 months and had access to first quality alfalfa hay after 40 days ; a vitamin supplement was given with the milk. During this period the average daily liveweight increase was 900 g. They were then weaned gradually to concentrates (bran, linseed cake and oats) for one month, and for the remaining 8 months they had good hay only. For the last 9 months daily liveweight increase was 600 g.

The second group was treated similarly for 2 months, when they were gaining 800 g. daily. For the next 2 months the whole milk was replaced by skimmed milk. Daily liveweight increase was 700 g. From 4 to 12 months they had hay and gained 600 g. daily.

Group 3 had 5 litres whole milk daily for one month, gaining 500 g. a day. For 2 months they then got 700 g. of a commercial milk powder, gaining 380 g. daily, followed by a month on concentrates as in the first 2 groups, and finishing on hay. The rate of daily gain was 450 g.

The fourth group was treated as the first, but only 5 litres daily of whole milk was allowed during the first 3 months. They gained 500 and 450 g. daily during the first 3 and last 9 months, respectively.

In body measurements and final liveweights groups 1 and 2 were greatly superior to groups 3 and 4, and the cost of 1 kg. liveweight increase was much less.—T. D. Bell.

3862

HANCOCK, J. **Studies in monozygotic cattle twins.** **10. General summary.** *N.Z. J. Sci. Technol.*

[4], 1953, **35**, 189-198. [Dept. Agric., Ruakura Animal Res. Stat., Hamilton, N.Z.]

This is a brief review of recent literature on cattle twins with special reference to frequency of monozygotic twinning, methods of diagnosis, twin efficiency values and heritability studies. The general conclusion is that, although the frequency of monozygotic twinning is low, sufficient numbers can be collected in any dairy cattle population to make large-scale investigations possible. Results from uniformity trials have shown the superiority of monozygous twins to unrelated animals as experimental material.—J. N. Aitken.

3863

KING, J. W. B. **A feeding experiment with twin cattle.** *Proc. Brit. Soc. Animal Prod.*, 1953, 76-84 (with discussion 84-85). [Animal Breeding Res. Organiz., Edinburgh.]

3864

KIDWELL, J. F. **Some growth relations in range cattle.** *J. Animal Sci.*, 1954, **13**, 54-60. [Dept. Animal Husb., Nevada Agric. Exp. Stat.]

Weight gains of cattle from weaning, fed through 2 winters, were studied in 4 periods: wintered on native hay, grazed on the range during the summer, grazed on aftermath during the autumn and finally wintered again on hay.

There was a positive correlation between the gains made during the 2 winter periods, and the correlations between any 2 successive periods were also significant, but negative, which suggested an inverse relation between adaptability to winter feeding and to summer grazing when there is a big change in environment. There was a high positive genetic correlation between gains in the winter feeding periods, indicating inheritance of adaptability, but in general environmental correlations were greater than genetic.—T. D. Bell.

3865

WINCHESTER, C. F. and HENDRICKS, W. A. **Energy requirements of beef calves for maintenance and growth.** *U.S. Dept. Agric. Tech. Bull.* No. 1071, July 1953, pp. 18. [Bur. Animal Indust., Agric. Res. Admin.]

Of 16 pairs of identical twin calves, aged between 3 and 6 months and weighing from 130 to 540 lb., one of each was fed below maintenance level, and the other above. Growth rates and total digestible nutrient (TDN) intakes were recorded. From the data the following equation for the estimation of the energy requirements of beef calves was derived:

$$f = 0.0553 w^{\frac{1}{2}} (1 + 0.805 g),$$

where f is the energy requirement in lb. TDN, w is

the bodyweight in lb. and g is the daily gain in lb. The energy requirement for maintenance is given when $g = 0$. A table computed from the equation for bodyweights for 200 to 800 lb. and daily increases from $\frac{1}{2}$ to 2 lb. is presented.—T. D. Bell.

3866

SEN, K. C., MURTHY, G. K., PREMACHANDRA, B. N., DASTUR, N. N. and RAY, S. C. **Effect of feeding iodinated casein on growth and food utilization by calves.** *Indian J. Dairy Sci.*, 1953, **6**, 201-216. [Indian Dairy Res. Inst., Bangalore.]

Heifers of the Gir and Sindhi breeds were divided into 2 comparable groups of 10 animals each. The animals in both groups were then divided into subgroups comprising those below or above one year of age. Iodinated casein was given to the experimental group at the rate of 2 g. per 100 lb. bodyweight for 26 weeks. During a further 10 weeks the iodinated casein supplement was increased to 4 g. per 100 lb. for 6 of the experimental animals and reduced to 1 g. per 100 lb. for the remaining 4 animals.

The rations of both groups during a 6-week pre-experimental period consisted of a concentrate mixture, mixed guinea grass and alfalfa, and ragi straw. When iodinated casein was given the amount of concentrates for both groups was increased by 25 per cent. Feed consumption and bodyweight were recorded. Digestibility coefficients and N balances were estimated in a metabolism trial with 6 control and 6 experimental animals. Growth rates of the treated animals were significantly reduced, more in older animals. Increasing the intake of iodinated casein caused a further reduction in the rate of growth. When the intake was reduced growth rate was accelerated. The treated animals consumed the same amounts of digestible crude protein and total digestible nutrients per 100 lb. bodyweight as the controls. Retention of N by the treated group was less than that of the control group.

It is concluded that induced hyperthyroidism raises the catabolism of body protein to supply energy, and as a result a significant amount of dietary protein is used to make good this loss instead of to support growth.—J. N. Aitken.

3867

KIDDER, R. W. and BEARDSLEY, D. W. **Protein and carbohydrate supplements for fattening steers on Everglades pastures.** *Florida Agric. Exp. Stat. Bull.* No. 493, May 1952, pp. 16.

Supplements of molasses, ground maize, cottonseed meal, and molasses with cottonseed meal for grazing Brahman steers were compared with grazing only in trials in 1947, 1948 and 1950. Only in the third year was the protein supplement

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superior to the carbohydrate supplements. The supplemented animals were better than the unsupplemented in liveweight increase and carcass grade, and the financial returns were greater, though there was a reasonable return from grazing alone.—T. D. Bell.

3868

JOUBERT, D. M. **The influence of winter nutritional depressions on the growth, reproduction and production of cattle.** *J. Agric. Sci.*, 1954, **44**, 5-66. [Dept. Animal Husb., Univ. Pretoria.]

A general survey of work on animal nutrition done at the University of Pretoria over the past 20 years is given as an introduction.

The trials reported were made from 1948 to 1952. Friesian, Jersey, Shorthorn and Afrikaner heifers were kept on veld pasture, and during the winter half of them received supplementary feed. The treatments were referred to as high- and low-plane.

Growth on the low plane showed great seasonal fluctuation, closely related to the total digestible nutrient content of the pasture as shown by analysis. There were also distinct breed differences: on the high plane the Afrikanders gained fastest, but on the low plane the Jerseys were superior.

Low-plane nutrition retarded development, Shorthorns being most and Jerseys least affected. The relative increases in the summer were greater in the low-plane groups.

Age at first calving had no influence on the ultimate size of the animal, but during pregnancy weight increase was much less in the low-plane group, and the calves were lighter at birth. High-plane heifers could be served 9 months earlier than low-plane.

During lactation dairy breeds grew steadily, but beef breeds, suckling their calves, lost weight for 10 months. High-plane beef breeds lost relatively more than low-plane, probably owing to greater milk yields. Weaning weights of calves suckling low-plane dams were less than those suckling high-plane, but by 12 months of age there was no sign of prenatal influence. In milk yield and butterfat percentage there was no significant difference between high- and low-plane dairy cows, but the latter showed greater persistency.—T. D. Bell.

3869

ANDREWS, F. N., BEESON, W. M. and JOHNSON, F. D. **The effects of stilbestrol, dienestrol, testosterone and progesterone on the growth and fattening of beef steers.** *J. Animal Sci.*, 1954, **13**, 99-107. [Dept. Animal Husb., Agric. Exp. Stat., Purdue Univ., Lafayette, Ind.]

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Three experiments were made with 120 Hereford steers. Steers which received subcutaneous implants of 60, 108 or 120 mg. stilboestrol or 80 mg. dienestrol, or a combination of 60 mg. stilboestrol and 200 mg. progesterone, made significantly greater weight gains than untreated controls. The administration of stilboestrol or dienestrol improved the efficiency of feed utilisation. The use of dienestrol and progesterone in combination in an injectable base had no significant effect. Steers which received a total of 255 mg. testosterone propionate did not gain as rapidly as controls. Treatment had no significant effect on dressing percentage. Carcass grade was reduced in some of the steers treated with stilboestrol. This treatment had the undesirable effect of elevating the tail head.—J. N. Aitken.

3870

ITTNER, N. R., LOFGREEN, G. P. and MEYER, J. H. **A study of pasturing and soiling alfalfa with beef steers.** *J. Animal Sci.*, 1954, **13**, 37-43. [Dept. Animal Husb., Imperial Valley Field Stat., El Centro, Calif.]

Rotational grazing, strip grazing, green soiling and wilt soiling as methods of using an alfalfa pasture seeded with barley were compared. There were 4 groups of 10 Hereford yearling steers. The trial lasted for 168 days. The rotational group was moved every 8 to 12 days, and the strip grazing group every 24 hr. The cut forage was allowed to wilt for up to 2 days for the wilt soilage group. Both the soilage groups were fed in dry lot. A small amount of oat hay was allowed to all to avoid bloat and scouring.

Daily gains in all groups were excellent and there was no difference between them. The amount of beef produced per acre was significantly greater by 36, 69 and 39 per cent. in the strip grazing, green soiling and wilt soiling groups, respectively, than in the rotationally grazed group.—T. D. Bell.

3871

HARDISON, W. A., REID, J. T., MARTIN, C. M. and WOOLFOLK, P. G. **Degree of herbage selection by grazing cattle.** *J. Dairy Sci.*, 1954, **37**, 89-102. [Dept. Animal Husb., Cornell Univ., Ithaca, N.Y.]

Holstein steers ranging in weight from 320 to 950 lb. were used in a series of trials with 6 herbages each at 3 to 5 different stages of growth. The basic design in all trials was to allow one group to graze herbage from the same source as that which was clipped and hand-fed to a similar group of stall-fed steers. Digestibility trials with all herbages were made on both hand-fed and grazing steers. The chromogen concentration of the faeces was used to estimate the amount and digestibility of the dry matter consumed by the grazing steers.

The faeces of the grazing steers contained significantly more crude protein, ether extract and ash and less crude fibre than the faeces of the hand-fed steers. All proximate constituents of the grazed herbage were more digestible than those of the clipped herbage. A reduction of the size of the area grazed tended to reduce the degree of selection. The content of crude protein and ether extract decreased and that of crude fibre increased as the herbage matured.

It was concluded that the chemical composition of clipped herbage is an unreliable index of the composition of herbage selected by grazing steers.

J. N. Aitken.

3872

PERRY, T. W., BEESON, W. M., HORNBACK, E. C. and MOHLER, M. T. **Aureomycin for growing and fattening beef animals.** *J. Animal Sci.*, 1954, **13**, 3-9. [Agric. Exp. Stat., Purdue Univ., Lafayette, Ind.]

An aureomycin supplement of 24 mg. per 100 lb. liveweight given to suckling Shorthorn calves receiving a creep feed of maize, oats and soya bean meal to 80 days of age stimulated growth and reduced scouring, which was serious in the control group.

On a growing ration yearling Shorthorns got 63.5 mg. aureomycin per head daily for 14 weeks, 127 mg. for the next 6 weeks and 190.5 mg. for the last 6 weeks. They gained faster and converted feed more efficiently than controls.

When similar groups of Hereford yearlings, some on growing and some on fattening rations, each with or without 75 mg. aureomycin, were compared, on the growing ration those getting the antibiotic gained faster and were more efficient than the others, but on the fattening ration aureomycin had no effect.

Shorthorn calves and yearlings on a free-choice diet supplemented with 75 mg. aureomycin gained faster and were more efficient than controls, but when the antibiotic was introduced gradually, 25 mg. daily for the first week, 50 mg. for the second and 75 mg. thereafter, growth rate and efficiency were not improved.

There was a temporary depression of appetite for a few days in all trials when aureomycin was introduced.—T. D. Bell.

3873

JOHANSSON, I. and HILDEMAN, S. E. Sambandet mellan vissa kroppsmaått och levande resp. slaktad vikt hos nötkreatur. [Relation between certain body measurements and live or carcase weight in cattle.] *Kgl. Lantbruksakad. Tidskr.*, 1953, **92**, 273-305. [Lantbrukshögsk. Inst. Husdjursetik.] English summary.

This paper deals with the prediction of liveweight and carcase weight in dairy cattle from

different body measurements. There is, as an introduction, a review of the literature on the subject. Dairy cattle from Swedish and Danish sources were measured.

The findings were that heart girth was most useful for predicting liveweight and was in fact as good as a combination of 2 more measures. It is suggested that it is preferable to use a series of linear equations each over a limited age range of the growing animal instead of a non-linear relationship to cover the whole range.

The errors in predicted liveweight and carcase weight are given along with the error obtained when the animal is weighed. A table is given which can be used to predict the liveweight and carcase weight from heart girth for lean, average and fat cattle. (From summary.)—A. W. Boyne.

3874

CLIFTON, E. S. and SHEPHERD, G. **Objective grade specifications for slaughter steer carcasses.** *Iowa Agric. Exp. Stat. Res. Bull.* No. 402, November 1953, 540-568. [Ames, Iowa.]

The subjective method of carcase grading as used at present is not satisfactory in respect of uniformity of grading. In an attempt to grade carcasses objectively, measurements were made on 355 steers, including thickness of fat on eye muscle; body length, depth and weight; length of loin, width of shoulder and of round, circumference of round and area of rib eye. Correlation coefficients were calculated and estimations made on combinations of these to obtain the best criteria.

W. Thomson.

3875

GREEN, W. W. **Relationships of measurements of live animals to weights of grouped significant wholesale cuts and dressing percent of beef steers.** *J. Animal Sci.*, 1954, **13**, 61-73. [Dept. Animal Husb., Maryland Agric. Exp. Stat.]

The wholesale cuts were grouped as follows: (1) round, trimmed loin and rib; (2) round, trimmed loin, rib and cross-cut. Liveweight was found to be closely associated with the weights of both groups of cuts. Width of shoulders and depth of twist were significantly and positively correlated with group 1 weights and both these measurements and width of hooks with group 2. Width of shoulders was significantly and positively correlated with dressing percentage.—J. N. Aitken.

3876

MEREGALLI, A. L'impiego delle farine di pesce e di balena nell'alimentazione del bestiame. [Fishmeal and whalemeal in cattle feeding.] *Riv. Zootec.*, 1953, **26**, 360-362; 1954, **27**, 12-13.

3877

HOLSCHER, C. E. and WOOLFOLK, E. J. **Forage utilization by cattle on northern Great Plains ranges.** *U.S. Dept. Agric. Circular* No. 918, June 1953, pp. 27. [N. Rocky Mountain Forest and Range Exp. Stat., Forest Serv.]

3878

PFEIFFER, G. Il foraggio conservato nell'alimentazione del bestiame. [**Conserved fodder in cattle feeding.**] *Riv. Zootec.*, 1953, **26**, 355-357. [Univ. Bonn.]

See also Abst. 3381.

MILK PRODUCTION

3879

HANSSON, A., CLAESSON, O. and BRÄNNÄNG, E. **Studies on monozygous cattle twins. 14. Milk secretion in relation to level of nutrition.** *Acta Agric. scand.*, 1954, **4**, 85-93. [Animal Breeding Inst., Wiad, Eldtomta, Sweden.]

Two pilot experiments are described. The twins used had been reared on the same plane of nutrition until first calving.

In the first experiment 3 twin pairs were used. All animals received the same maintenance ration relative to bodyweight. For milk production one member of each set received 0.35 and the other 0.45 Scandinavian feed units per kg. fat-corrected milk produced.

In the second experiment 6 twin pairs were used. The first member of each twin set to calve was used as control. The remaining 6 cows were placed in 3 groups of 2 animals each and were fed at levels of 80, 90, and 110 per cent. of that of the corresponding control animal.

The results from both experiments showed that a rising level of nutrition was accompanied by an increase in both milk yield and growth. The efficiency of feed utilisation fell as the level of nutrition rose.—J. N. Aitken.

3880

HANSEN, K. Afkomsprøver med tyre. 8. [**Progeny testing with bulls. 8.**] *Forsøgslab. København Beretn.*, 1954, No. 270, pp. 183. German and English summary.

All heifers are brought into as good condition as possible before calving on a ration of 4 feed units (FU) roots, 1 FU beet tops and 2 kg. of a mixture of 30 per cent. cake and 70 per cent. grain, varied according to the condition of the individual heifer.

During the winter the ration, from attainment of a yield of 10.5 kg. of 4 per cent. milk, consists of 1.5 FU swedes, 3.25 FU beet, 1 FU beet top silage, 2.5 kg. hay, concentrate mixture 1, and increasing amounts of concentrate mixture 2, at the rate of

0.4 kg. per kg. 4 per cent. milk. Mixture 1 was, per cent.: soya bean meal 15, cottonseed cake 20, groundnut cake 15, sunflower seed (expeller process) 17, linseed cake 8, coconut cake 18, fluid molasses 5 and dicalcium phosphate 2; mixture 2, per cent.: mixture 1, 35, wheat bran 15, barley 48 and dicalcium phosphate 2. The first provides 112 FU per 100 kg. and 306 g. digestible true protein per kg., the second 98 FU per 100 kg. and 148 g. digestible true protein per kg. For the first 6 weeks the cows are fed as if milk yield were 2 kg. above the actual yield.

In summer the cows are on pasture and, since its quantity and quality cannot be fixed, it is supplemented as appears necessary with roots, hay, silage and a concentrate mixture of 60 parts mixed grain, 30 oilcake and 10 molassed bran. Hence about two-thirds of production is in the winter under relatively highly standardised conditions and the rest under less uniform conditions. For the computation of feed consumption, summer supplements are recorded and pasture is "computed by the accepted rules" [not further described].

On the average of all the tests with Red Danish cows, winter milk production cost 0.41 FU per kg. 4 per cent. milk, with a range from 0.45 to 0.36. The most economical group put on 74 kg. weight and the least economical 25 kg. in the winter half-year. On the average, the protein allowance was, daily, 250 g. digestible true protein for maintenance and 120 g. for growth, and 60 g. per kg. 4 per cent. milk. The average consumption per kg. 4 per cent. milk was 68 g.—I. Leitch.

3881

THIEULIN, G. Possibilités d'action sur la production du lait: Lactations provoquées—lactations améliorées. [**Possibilities of influencing milk yield: induced lactation: increased lactation.**] *Lait*, 1954, **34**, 1-10.

3882

BAILEY, G. L. and BROSTER, W. H. **The influence of live weight on milk production during the first lactation.** *J. Dairy Res.*, 1954, **21**, 5-9. [Nat. Inst. Res. Dairying, Univ. Reading.]

The records of 99 Dairy Shorthorns, daughters of 7 bulls, were examined. There was a positive relationship between the lactation yield of 4 per cent. fat-corrected milk and liveweight at calving. But there was no correlation between liveweights at calving of dams and daughters, so that selection by liveweight could not be used to increase herd production.—T. D. Bell.

3883

USHAKOV, V. A. [**Influence on production of the age at which heifers are first served.**] *Sovet. Zootekh.*, 1953, **8**, No. 3, 76.

3884

RAGAB, M. T., ASKER, A. A. and GHAZY, M. S. **Effect of age on total milk yield and length of lactation period in the Egyptian buffalo.** *Indian J. Dairy Sci.*, 1953, **6**, 181-188. [Dept. Animal Breeding, Fac. Agric., Fouad I Univ., Cairo.]

Milk records of a herd of Egyptian buffaloes were used and a statistical analysis of 923 lactations was made. The average age at first calving was 40.2 months. Total milk yields increased with increasing age at first calving. Milk production also increased with advance in age to the third lactation, after which it declined. Maximum production was attained in the third lactation. Absolute age and age at first calving had no effect on length of lactation.—J. N. Aitken.

3885

SEN, K. C., LAZARUS, A. J., RANGASWAMY, M. C. and ANANTAKRISHNAN, C. P. **Observations on some Indian cattle. 5. Cross-breeding for milk production.** *Indian J. Dairy Sci.*, 1953, **6**, 223-234. [Indian Dairy Res. Inst., Bangalore.]

Hariana, Sahiwal and Red Sindhi cows were crossed with Ayrshire bulls and the crosses were back-crossed with either Ayrshire or indigenous bulls to give animals with varying amounts of Ayrshire blood. The production performance of the crosses under tropical conditions was compared with that of the purebred native cows. A similar study was made with Friesian × Red Sindhi cows. The breeding programme extended over 40 years.

Crossbred cows produced more milk and had longer lactations and shorter dry periods than the purebred native cattle. Age at first calving rose as the amount of indigenous blood increased. The percentage incidence of foot and mouth disease and abortion increased as the amount of Ayrshire blood increased. Crossbred cows remained in the herd longer than did cows of the native breeds.—J. N. Aitken.

3886

BOYD, L. J., SEATH, D. M. and OLDS, D. **Relationship between level of milk production and breeding efficiency in dairy cattle.** *J. Animal Sci.*, 1954, **13**, 89-93. [Kentucky Agric. Exp. Stat., Lexington.]

No significant correlation was found between the level of milk production during the first 120 days of lactation and the number of services required for successful conception when the breeding and production records of 225 Jersey, 208 Holstein and 86 Guernsey cows were analysed statistically.—J. N. Aitken.

3887

JARL, F. **Mineral metabolism in dairy cows.** *Kgl. Lantbrukshögsk. Ann.*, 1953, **20**, 151-203. [Nat. Animal Exp. Stat.]

Mature cows of the Swedish Red and White breed were used. The cows were depleted of P by being fed on a ration of hay, dried molasses, beet pulp and soya bean meal or peanut meal for 4 weeks before calving to 6 weeks after calving. During the first 6 weeks of lactation serum P fell to 1 or 2 mg. per cent. The availability of P from different sources was estimated in balance trials by giving equal amounts of P in the form of bone meal, dicalcium phosphate or disodium phosphate. The Ca:P ratio was kept constant by the addition of calcium carbonate. The availability of P in wheat bran, ground oats and a clover grass silage prepared by the addition of 1.67 per cent. of an acid salt was also estimated. The effect of vitamin D on the P balance was studied.

The P was equally well utilised whether it was supplied in the form of bonemeal, dicalcium phosphate or disodium phosphate or as an acid phosphate added as a preservative to silage. Blood P returned to normal within 10 to 14 days when 10 g. P was supplied as bonemeal, dicalcium phosphate or disodium phosphate. The availability of P in wheat bran and ground oats was significantly less than that of P as disodium phosphate. There was an improvement in P balance when the wheat bran ration was supplemented with vitamin D. Serum Ca was unaffected by the low P content of the feed. Ca retention was higher when mineral phosphates were given than when wheat bran and oats were used as the sole source of P.

J. N. Aitken.

3888

MATHUR, M. L. and DESAI, S. V. **Studies on the effect of different fodders on the milk yield and its composition and mineral metabolism in Sahiwal cows.** *Indian J. Vet. Sci.*, 1953, **23**, 143-173. [Indian Agric. Res. Inst., New Delhi.]

The balance data, which refer to 4 high-yielding cows, were collected in 1946 and are in extension of work already reported in Abst. 2744, Vol. 17. A grain mixture to which supplements of NaCl and CaCO₃ were added was given according to requirements [feeding system not stated] and 4 roughages were used, green berseem (*Trifolium* sp.) manured with 329 lb. ammonium phosphate per acre, green unmanured berseem, green alfalfa, or jowar (*Sorghum* sp.) silage plus alfalfa hay. Balances of Ca, P, Na, K and Cl were studied for the latter 6 of the 12-day periods during which the roughages were given on the Latin square design. Methods of analysis are described and

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full details of the results for each cow on each roughage are presented and summarised in 33 tables.

The different roughages were without significant effects on milk yield or bodyweight of the cows. Utilisation of each element was considered in terms of intake minus loss in faeces and urine. The mean intake of Ca for the 4 cows was highest during the period of manured berseem and it was then that the average balance was greatest; during the jowar silage plus hay period both intake and balance were lowest. Assimilation of Ca was between 15 and 30 per cent. of intake and was better on green berseem or alfalfa than on silage plus hay. Positive balances of Mg were maintained in all cows but one which was in the very early stages of lactation. Balances of P were negative except for 2 animals in their periods with manured berseem. In some of the cows balances of Na were negative during feeding of alfalfa and silage plus hay; the positive balances on green berseem were highly significant. Balances of K and Cl were positive with all fodders.

To maintain positive balances in cows producing between 30 and 40 lb. milk it is concluded that the following amounts of these constituents are needed in the daily ration: between 100 and 200 g. CaO, 80 g. MgO, about 100 g. Na₂O, 190 g. K₂O and between 112 and 130 g. Cl; for P₂O₅ 120 g. daily was not enough.—D. Harvey.

3889

DIJKSTRA, N. D., DAMMERS, J. and FRENS, A. M. Vergelijkende voederproeven met vet-arm en meer vet-rijk krachtvoer bij melkvee. [Comparative tests with low-fat and high-fat concentrates for milk cows.] *Versl. Landbouwk. Onderzoek.*, 1953, No. 59.6, pp. 63. English summary.

Three experiments were made each with 2 groups of cows and with 82 animals in all. For a long time before the studies began a low-fat concentrate mixture was given to the cows. In the first 2 experiments the procedure was the same. One group was given the low-fat mixture of extracted linseed, groundnut and coconut meals with other low-fat products throughout the 3 periods of the experiment; the other group was given this same mixture during the first and third periods but in the second it was replaced by one containing more fat and prepared from pressed instead of extracted meals. The third experiment differed by being in 4 periods, during the second and third of which changes were made also in the roughage.

In the first experiment 26 Friesian cows were used and the roughage given was silage and hay. Intakes of fat per cow daily were on the average 420 g. and 523 g. in the experimental period.

There was no difference between the groups in liveweight or condition and none of statistical significance in milk or fat production over the 28 days the periods lasted.

The second experiment was in 2 parts at separate centres with 22 Friesian and 12 M.R.Y. cows and with the first and third periods lasting 21 days and the experimental periods 56 days. Roughages were hay, fodder beet and rye straw; the low-fat and high-fat intakes were 144 and 172 g. and 288 and 306 g., respectively, at the 2 stations. There was little difference in weight and condition of the cows but at both centres production by the pressed cake group was higher than by the extracted cake group by 1.65 ± 0.28 and 1.00 ± 0.38 kg. milk and 63.6 ± 10.7 and 32.8 ± 14.2 g. fat per cow daily.

The third experiment of the same length as the second was with 22 Friesian cows and roughage was fodder beet, straw, and hay made from clover in the first part and from grass in the second part of the experimental period. The intakes of fat in these periods were 188 and 249 g. by the extracted cake group and 339 and 373 g. by the pressed cake group. The differences in milk production in these periods were 1.19 ± 0.24 and 0.92 ± 0.18 kg. and in fat production 46.8 ± 11.8 and 27.0 ± 9.5 g., in each case in favour of the pressed cake group.

It is concluded that the fat content of the roughage as well as of the concentrate mixture must be considered. According as the roughage consists of silage and certain hays or of other hays, fodder beet and straw and, as a consequence, is high or low in fat, the fat in the concentrate mixture may vary from 1.5 to between 4.8 and 5.8 per cent. The part that fermentation products of crude fibre may play in reducing the need for crude fat is briefly discussed.—D. Harvey.

3890

DAVIDOV, R. and ARISTOVA, V. Vliyanie ratsionov kormleniya korov na svoistva molochnogo zhira i kachestvo masla. [The effect of linseed cake in the ration of cows on the properties of butterfat and the quality of butter.] *Mol. Prom.*, 1953, 14, No. 10, 31-34. [Sel'khoz. Acad. Timiryazev, Moscow.]

Three groups of cows were given for 95 days well balanced diets, one a control and two of them with 140 and 240 g. linseed cake per kg. milk produced. The relative milk yields in the 3 groups were 100, 105.6, 111.1 and for fat content 100, 107.6, 112.4. Butter was made 5 times during the feeding period; samples were tested organoleptically, and bacterial counts, viscosity and the usual physicochemical constants were estimated on the fresh samples and after storage for 12 months at -10°C . The results are

tabulated. The butter from the milk of the group 3 cows was yellower in colour, and had a lower viscosity, lower saponification value and higher iodine number than that from the other 2 groups. It was of inferior keeping quality. It is recommended that the amount of linseed cake given should not exceed 140 g. per kg. milk.

W. Hughes.

3891

RAMSEY, D. S. and MILES, J. T. **Cottonseed vs. cottonseed meal and corn as a protein source in a concentrate mixture for dairy cows.** *J. Dairy Sci.*, 1953, **36**, 1308-1312. [Dept. Dairy Husb., Mississippi State Coll., State College.]

The 2 rations were compared in a double reversal trial of three 28-day test periods with 2 groups each of 9 Jersey cows and 1 Guernsey. The cottonseed ration consisted of equal parts of wheat bran, oats and whole cottonseed. In the control ration a mixture of 4 parts ground maize and 3 parts expeller-extracted cottonseed meal was substituted for the cottonseed on an equal weight basis. The mixtures were given at the rate of 1 lb. for each 3 lb. of fat-corrected milk produced. Hay and sorghum silage were given to appetite. Milk, butterfat percentage and body-weight were recorded.

When cottonseed was given milk production, fat-corrected milk production and butterfat percentages increased. Differences between the groups in roughage consumption and bodyweight gains were not significant.—J. N. Aitken.

3892

DALTON, H. L., HUFFMAN, C. F. and RALSTON, N. P. **The effect of feeding concentrates with different degrees of fineness and water contents on the eating and milking times in dairy cattle.** *J. Dairy Sci.*, 1953, **36**, 1279-1284. [Dept. Dairy, Michigan Agric. Exp. Stat., East Lansing.]

The concentrates were ground in a hammer mill using 1/16, 1/8 and 5/16 in. screens and water was added to the air-dry concentrates to make the ratio of water to concentrates 0.5:1, 1:1 and 1.5:1. In 1 trial 12 Brown Swiss cows were kept indoor for the experiment. In a second trial 11 Brown Swiss and 2 Holstein cows were used to study effects indoor and outdoor. The time required to eat the concentrates decreased as the ratio of water to concentrate increased. The degree of fineness of the concentrates had no effect on the eating time. There was a decrease in milking rate as concentrate consumption rate decreased. Cows on good pasture ate air-dry concentrates more slowly than under barn feeding conditions.—J. N. Aitken.

3893

BECKER, R. B. and ARNOLD, P. T. D. **Citrus pulp in dairy rations.** *Florida Agric. Exp. Stat. Circular* S-40, November 1951, pp. 6.

The uses of citrus pulp in rations for dairy cows are discussed. It is a carbohydrate feed fairly high in energy and Ca but deficient in protein and P. When it is included in balanced rations for cows consideration should be given to additional protein, P and other mineral supplements and green leafy roughage, either pasture, green hay or silage. Concentrate mixtures for use with citrus pulp are outlined.—J. S. Thomson.

3894

WAUGH, R. K., MOORE, J. L., LUCAS, H. L. and FAIRES, E. W. **Wood molasses as a feed ingredient for lactating dairy cows.** *J. Animal Sci.*, 1954, **13**, 44-48. [Dept. Animal Indust., N. Carolina Agric. Exp. Stat.]

Wood molasses produced from mixed hard woods by hydrolysis with sulphuric acid was given to lactating cows at levels of 10 and 20 per cent. of the concentrate mixture and in another trial at rates of 4 and 6 lb. daily. Control groups received no molasses. The molasses was well utilised by the cows and no deleterious effect was noted during 112 days. It was estimated that 1 lb. molasses could replace ½ lb. grain.—J. N. Aitken.

3895

FERRARI, E. **Erbe primaverili di marcita e alimentazione della bovina da latte.** [The spring grasses of the "marcita" and the feeding of dairy cattle.] *Riv. Zootec.*, 1954, **27**, 83-84.

In the spring there is very little clover in the "marcita" pastures. Analyses of 78 samples from the province of Milan, cut between March and June, gave the following average percentage composition, with the digestible percentage in brackets: dry matter 15.65, protein 2.27 (1.25), ether extract 0.89 (0.53), N-free extract 7.0 (5.0), fibre 3.80 (2.27). One quintal was equal to 9.80 feed units and the nutritive ratio was 1:7.1. From these data it was apparent that the forage was not suitable as the only ration for dairy cattle, since the nutritive requirements could not be met by the amount they could eat. The nutritive ratio was unbalanced for milk production, and protein intake would be insufficient. A table of suggested combinations of the forage and concentrates is presented.—T. D. Bell.

3896

LITTLE, C. J., NORDEN, A. J. and WOLCOTT, A. R. **Baled hay (field cured) compared with hay crop silage for winter feeding of dairy cows.** *Quart. Bull. Michigan Agric. Exp. Stat.*, 1953, **36**, 212-218.

Field-cured baled hay and silage made from the same crop and cut at the same time were compared for milk production, with 3 groups of 3 mature Holstein cows. The crop was of alfalfa, brome-grass, timothy and quack grass, and was harvested at the beginning of July. The results are presented in tables, and indicate that for milk yield and butterfat production there was no significant difference between the feeds.—T. D. Bell.

3897

BRUBAKER, R. E. and REAVES, P. M. **The effect of the ensiling process on wild onion and ragweed flavors in silage and in milk.** *J. Dairy Sci.*, 1954, **37**, 58-59. [Dept. Dairy Husb., Virginia Polytech. Inst., Blacksburg.]

Silage was made from mixed grasses containing 10 to 15 per cent. of wild onion (*Allium vineale*). Ground maize was added as preservative. The silo was opened after 56 days; the silage had a strong "pickled onion" smell.

A cow was given 10 to 12 lb. silage before milking on 4 successive days and consumed 5 to 7 lb. on each occasion before milking and the rest later. The milk was tainted with an onion flavour.

A second test was made using clover and wheat stubble silage containing 45 per cent. ragweed with molasses added as preservative. The milk was not tainted.—P. C. Jowsey.

3898

ALEXANDER, G. I., HEGARTY, A. and KENNY, G. C. **Improving dairying on the marginal coastal lands of Kin Kin-Mooloolah.** *Queensland Agric. J.*, 1953, **77**, 285-292. [Cattle Husb. Branch, Div. Animal Indust., Dept. Agric., Brisbane.]

3899

McMEEKAN, C. P. **Controlled versus uncontrolled grazing in dairy production.** *Proc. Ruakura Farmers' Conference, Hamilton, N.Z.*, 1953, 161-162 (with discussion 162-164).

3900

HOLMES, W. **Modern methods of grassland management in feeding the dairy herd.** *Proc. Nutrition Soc.*, 1954, **13**, 19-22. [Hannah Dairy Res. Inst., Kirkhill, Ayr.]

3901

BOROVKOVA, E. I. **[Feeding ensilage to dairy cows.]** *Sotzial. Zhivot.*, 1952, **14**, No. 12, 13.

3902

BARTLETT, S. **Economies in feeding for milk production.** *Proc. Nutrition Soc.*, 1954, **13**, 16-18. [Nat. Inst. Res. Dairying, Univ. Reading.]

3903

CRICHTON, J. A. and AITKEN, J. N. **The economical rearing of dairy heifers.** *Proc. Nutrition Soc.*, 1954, **13**, 10-16. [Rowett Res. Inst., Bucksburn, Aberdeenshire.]

3904

BAILEY, G. L., CLOUGH, P. A. and DODD, F. H. **Rate of milk secretion in dairy cattle in the intervals between consecutive milkings.** *Nature*, 1954, **173**, 404-405. [Nat. Inst. Res. Dairying, Univ. Reading.]

Five cows were milked at intervals of 3, 6, 9, 12, 15 and 18 hr., at least 5 consecutive milkings for each length of interval. By excluding the results of the first milking after each change the effects of residual milk were eliminated. The results showed that the rate of secretion of both milk and fat declined with increase in milking interval. The rate of decline of fat secretion was not greater than that of milk secretion.—T. D. Bell.

3905

MARZANI, A. **Alte produzioni e longevità. [High production and longevity.]** *Riv. Zootec.*, 1954, **27**, 18-19.

A study of dairy cows.

See also Absts. 2933, 2934, 2939.

REPRODUCTION

3906

PRABHU, S. S., GUHA, S. and BHATTACHARYA, P. **Replacement of plant proteins by animal proteins in the rations of breeding bulls and its effect on semen production.** *Indian J. Vet. Sci.*, 1953, **23**, 175-184. [Animal Genetics Sect., Indian Vet. Res. Inst., Izatnagar.]

When bloodmeal was included in the concentrate ration of 4 Kumauni hill bulls at a rate sufficient to replace 30 per cent. of the crude protein in a normal ration there was no significant difference in semen characteristics or reaction times when compared with those of 4 bulls fed in the normal way.—J. N. Aitken.

SHEEP

3907

McKENNA, C. T. **Some aspects of nutrition in the breeding ewe and her lamb.** *J. Dept. Agric. S. Austral.*, 1953, **57**, 137-143. [Dept. Animal Husb.]

3908

STARKS, P. B., HALE, W. H., GARRIGUS, U. S., FORBES, R. M. and JAMES, M. F. **Response of lambs fed varied levels of elemental sulfur, sulfate sulfur and methionine.** *J. Animal Sci.*, 1954, **13**, 249-257. [Dept. Animal Sci., Univ. Illinois, Urbana.]

An experiment with 40 growing lambs to study the utilisation of inorganic S and urea N is described. The utilisation at different levels of elemental S 0.2, 0.4 and 0.6 per cent., sodium sulphate 0.89, 1.33 and 1.78 per cent. or DL-methionine 0.2, 0.5 and 0.7 per cent. was compared. Weight gains and wool growth of lambs treated with S, regardless of form, were significantly greater than those on the basal ration (92 per cent. N from urea, 0.054 per cent. total S). No statistically significant difference was noted between sources or levels of S given. The high levels of urea had no effect on blood urea.—J. C. Gill.

3909

CLARKE, E. A., BARTON, R. A. and WILSON, G. S. **The effect of highly improved and topdressed pastures on the thrift and production of sheep.** *Massey Agric. Coll. (Univ. New Zealand)*, 1953, pp. 92.

A large-scale study is reported of the effect on sheep and lamb production of grazing on high-producing pasture strains and on top-dressed pastures. In the pasture trials the following mixtures were used: (1) pedigree perennial ryegrass (p.r.g.) and pedigree white clover (high HCN); (2) pedigree p.r.g. and uncertified white clover (low HCN); (3) pedigree p.r.g. and mother white clover; (4) mother p.r.g. and mother white clover; (5) mother p.r.g. and pedigree white clover. Data on 16 ewes per group were collected over 4 years. Each of the 5 groups was moved rotationally round 4 one-acre plots. Extra stock were put on as required.

There were large differences in total amount and seasonal production between the 5 pastures and the superiority of the pedigree clover was not marked. Differences in stock-carrying capacity were highly significant. There was no significant difference between the groups on the different pastures in respect of ewe weights, ewe deaths, number and weight of lambs, carcase grade and

age at slaughter of lambs or in any fleece characteristic. No effect on stock from the clovers high in cyanogenetic glucosides was evident.

In the manuring trials the following treatments were given to simple ryegrass and white clover mixtures: (1) 1 cwt. superphosphate per acre per annum; (2) 4 cwt. superphosphate per acre per annum; (3) 4 cwt. basic slag per acre per annum; (4) 4 cwt. superphosphate per acre per annum with an initial 2 tons ground limestone and 5 cwt. annually thereafter; (5) as (4) with 2 cwt. of 30 per cent. potash salts per acre per annum. The sward was kept young and tender and at the most nutritious stage of growth. Data on 20 ewes per group, each group being moved rotationally round 5 one-acre plots, were collected over 7 years. Extra stock were put on as required.

There were large differences between treatments in pasture production and stock-carrying capacity. The superiority of ground limestone was most marked throughout each year, and also the effect of lime from the basic slag. Potash showed no beneficial effect. There was no significant effect on ewe, lamb or wool production.

It is thought that near perfect pasture control by extra stocking and mowing as required was achieved in these trials and the pastures were highly satisfactory for ewes and lambs. This control may be difficult to attain under commercial conditions.—J. C. Gill.

3910

THOMSON, D., CORNER, H. H. and CUNNINGHAM, J. M. M. **Silage for sheep.** *Scot. Agric.*, 1953-54, **33**, 155-159. [Cessford, Kelso.]

In trials over 3 years turnips were compared with grass silage for feeding pregnant and lactating ewes. The turnips group received 14 lb. turnips, 1 lb. hay and $\frac{1}{2}$ lb. concentrates before, and 20 lb. turnips, 1 lb. hay and $1\frac{1}{2}$ lb. concentrates after lambing. The silage group had 8 lb. silage before and 12 lb. after, with the same concentrates as the other group. There were 50 Half-bred ewes in each group each year. The feeding of roots began about 6 weeks before lambing and that of silage 2 or 3 weeks earlier. Liveweight increase was satisfactory in both groups, and lambs from both groups were equally thrifty and hardy, and had the same rate of liveweight gain. Fleece weights of ewes, milking and thriftiness when grazing after the supplements were discontinued were also similar in both groups.

On a practical scale, with a flock of 1300 ewes, roots were replaced by silage, fed to appetite, with some concentrates, and the results of the trials reported above were confirmed.—T. D. Bell.

N.A. and R., July 1954

3911

STITT, W. A., PERRY, T. W. and BEESON, W. M. **Supplementation of farm roughages for pregnant ewes in dry lot.** *J. Animal Sci.*, 1954, **13**, 234-241. [Dept. Animal Husb., Agric. Exp. Stat., Purdue Univ., Lafayette, Ind.]

Three experiments with a total of 566 Hampshire × Rambouillet ewes are described. In trial 1 a basal ration of maize cobs supplemented with protein, carbohydrate, minerals and vitamins A and D was compared with a similar ration with vitamin B₁₂, the basal ration plus B vitamin complex and the basal ration plus alfalfa meal, as a feed for ewes during gestation and pregnancy. Ewes on alfalfa meal produced on the average 2 lb. more wool per head than those of the other groups and the vitamin B₁₂ group dropped and weaned a slightly higher percentage of lambs than the others. There was no significant difference in birthweight or in daily gain between the lambs.

In trial 2, a mineral and vitamin supplement was given with maize cobs, maize cobs and vitamin B₁₂, maize silage and grass silage. Ewes on maize silage gave significantly more wool than the cob groups and produced significantly larger lambs than did those on cobs or grass silage. The addition of vitamin B₁₂ to the ration with maize cobs was of no benefit. Again there was no difference in daily gain of lambs.

In trial 3, cobs plus sugar, cobs plus molasses, maize silage, maize silage plus sugar, maize silage plus molasses, and alfalfa hay were compared. Groups with a supplement of maize silage had heavier fleeces than cob groups and heavier lambs than any of the other groups. Ewes on alfalfa hay produced healthier and more vigorous lambs, which made a higher daily gain than the lambs of the other groups.—J. C. Gill.

3912

NEALE, P. E. **Alfalfa cubes for fattening lambs and wethers.** *New Mexico Agric. Exp. Stat. Bull.* No. 375, April 1953, pp. 17.

In the first experiment 6 groups of 20 lambs each were used. Half were hand-fed with medium-grade alfalfa hay and sorghum grain, and half were self-fed with cubes of low-grade alfalfa hay, sorghum grain and 10 per cent. molasses. The cubes were of 2 grades, the first with 60 per cent. hay and 30 per cent. grain, the second with 50 per cent. hay and 40 per cent. grain, and the lambs were changed from the first to the second after 25 days' feeding. The groups were divided into light, medium and heavy, according to initial liveweight of 70, 80 and 90 lb., and were fed to 100 lb. The trials were annually for 3 years. The average results showed that in rate of liveweight increase and efficiency of feed utilisation the self-fed groups were better than the hand-fed,

and the low-grade hay, incorporated in the cubes, was equal to the medium-grade fed separately.

In the second experiment, repeated for 3 years, wethers of average initial liveweight 74 lb. were fattened to 100 lb. There were 5 groups of 20 in each year. Groups 1 and 2 were hand-fed with sorghum grain, 1.0 or 1.25 lb., and medium-grade alfalfa hay to appetite. Group 3 had cubes of low-grade alfalfa hay 60, sorghum grain 30 and molasses 10 per cent., self-fed. Group 4 had cubes of low-grade alfalfa hay 50, sorghum grain 40 and molasses 10 per cent., and group 5 was fed as group 4 but grazed on irrigated alfalfa pasture. Group 3 was most efficient in feed utilisation and rate of liveweight increase. All self-fed groups were better than hand-fed, but the additional grazing in group 5 gave no advantage and was least economical.—T. D. Bell.

3913

PÁLSSON, H. Áhrif fangs á fyrsta vetri á vöxt og þroska ána. [The effects of pregnancy and milk production of yearling ewes on their growth and development.] *Rit Landbúnadardeildar, B-Flokkur*, No. 5, 1953, pp. 84. [Reykjavik.] English summary.

Ewes were mated at 7 months and slaughtered at 16 months of age. Carcasses were examined and the effects of pregnancy and suckling were investigated. For comparison there was a group which did not conceive, one which lost their lambs at birth, and one which suckled their lambs.

Early pregnancy and the strain of parturition retarded development and growth of fat, but did not affect conformation or growth and development of bone or muscle. The suckling of lambs resulted in lighter carcasses, and though the length of the long bones was not affected, their thickness and the growth and development of muscle and fat were retarded.

In the second part of the investigation ewes slaughtered at 28 months of age were compared. There were 5 groups: ewes which had never reared lambs; barren as yearlings and suckling singles in the second year; rearing one lamb as yearlings and again in the second year; rearing one lamb as yearlings and twins in the second year; and rearing one lamb as yearlings and none in the second year. The results indicated that the ewes retarded in the first year by rearing lambs were able to make up 60 per cent. of the loss during the second year, even when rearing another lamb, or twins. It is concluded that the practice of mating Iceland ewes at 7 months of age is justifiable. (From summary.)—T. D. Bell.

3914

BEESON, W. M., PERRY, T. W., STITT, W. A. and OUTHOUSE, J. B. **Antibiotic pellet implants**

for suckling lambs. *J. Animal Sci.*, 1954, **13**, 242-244. [Dept. Animal Husbandry, Agric. Exp. Stat., Purdue Univ., Lafayette, Ind.]

Two trials were made with 334 lambs in all. Subcutaneous implantation of lambs at 2 days of age with antibiotic pellets containing bacitracin or bacitracin and penicillin had no significant effect on growth rate. Implantation of lambs at 2 days of age or at 44 days of age with aureomycin pellets had no effect on growth rate.—J. C. Gill.

3915

RICHARD, R. M., SHUMARD, R. F., POPE, A. L., PHILLIPS, P. H. and HERRICK, C. A. **The effect of phlebotomy versus stomach worm, *Haemonchus contortus*, infection on the growth and certain blood constituents of lambs.** *J. Animal Sci.*, 1954, **13**, 274-282. [Wisconsin Agric. Exp. Stat., Madison.]

Blood was removed daily from non-infected lambs. The quantity removed was sufficient to keep the Hb values about the same as those of lambs artificially infected with *Haemonchus contortus* larvae. There were 4 different dietary groups.

In the infected lambs Hb, plasma nicotinic acid and vitamin B₆ values were reduced and growth was retarded. The removal of blood from non-infected lambs produced a similar effect. Lambs which received additional trace minerals, including Co, Cu, Fe and Mn, plus steamed bonemeal had less severe anaemia and showed better weight gains. Additional protein, with or without trace minerals, did not appear to have any effect.

G. C. Hunter.

3916

SPEDDING, C. R. W. **Effect of a sub-clinical worm-burden on the digestive efficiency of sheep.** *J. Comp. Pathol.*, 1954, **64**, 5-14. [Grassland Res. Stat., Stratford on Avon.]

Digestibility trials were made on 6 pairs of twin lambs. One of each pair was artificially infected with larvae of *Trichostrongylus axei*. The uninfected control lambs gained weight at a significantly greater rate than the infected. The general level of digestibility was lower in the infected lambs than in the controls. The apparent digestibility of crude protein was lower in the infected lambs; that of crude fibre showed no difference. The low liveweight gain was due chiefly to a considerable reduction of appetite and partly to reduction of digestive efficiency.

G. C. Hunter.

3917

WHITING, F., NELSON, W. A., SLEN, S. B. and BEZEAU, L. M. **The effects of the sheep ked (*Melophagus ovinus* L.) on feeder lambs.** *Canad. J. Agric. Sci.*, 1954, **34**, 70-75. [Exp. Stat., Lethbridge, Alta.]

Two groups of 6 feeder lambs, one ked-free and one ked-infested, were well fed and one group of 6 lambs, ked-infested, were poorly fed 4 months in each of 3 successive years. In the third year there were 11 lambs in each group. In all 3 years the ked-infested lambs equalled the ked-free lambs on the same feeding level in liveweight gain and wool production. Ked populations on the poorly-fed lambs increased more rapidly and were larger than those on well-fed lambs. The number of keds on a sheep was not related to the suint or fat content of the fleece or to certain blood constituents.—J. C. Gill.

3918

EBERSÖHN, J. P. **Dorper sheep in the northern Cape Province.** *Farming in S. Africa*, 1953, **28**, 425-429. [Koopmansfontein Agric. Res. Stat.]

Dorper sheep have been bred from a Dorset Horn × Persian ram crossed with Blackhead Persian ewes, a project started in 1944. They are an admirable breed for the soil and climatic conditions of northern Cape Province. The ewes have been selected for fertility, milk flow and conformation. Growth curves of lambs and tables of age and liveweight are presented. Management is described.

Two head of cattle to 1 of sheep are grazed per morgen (2.1 acres), and since 1951, when regular dosing against worms and rotational grazing were introduced, marketable lambs of 75 lb. liveweight have been produced at 20 weeks of age. Average lambing percentage was 90 from 1947 to 1952, and the percentage of ewes in lamb after service was 95.—T. D. Bell.

3919

VENTER, J. J. **The necessity of sound growth in wool.** *Farming in S. Africa*, 1953, **28**, 374. [Grootfontein Coll. Agric., Middelburg, Cape Province.]

Ten sheep were used [breed not stated]. For a first period they received a good diet, then for a second period they were given a poor diet of veld hay and finally they received the good diet for a third period [duration of periods not given].

The average fineness of the wool was 22.2, 16.2 and 23.0 μ ., and the tensile strength under a strain of 106 g. per sq. cm. 1.09, 0.75 and 1.24 for the 3 periods. Between the good and poor feeding periods there was an average decrease in fibre thickness of 28 per cent. and in tensile strength of 37 per cent.

Although these results were obtained under extreme conditions, any reduction of feeding standards must have some adverse effect on wool quality.—P. C. Jowsey.

3920

BURNS, M. **Observations on the development of the fleece and follicle population in Suffolk sheep.** *J. Agric. Sci.*, 1954, **44**, 86-99. [Wool Indust. Res. Assoc., Headingley, Leeds.]

3921

WALKER, D. E. **Elastration and other methods of castration in relation to carcass quality of fat lambs.** *N.Z. J. Sci. Technol.* [A], 1953, **35**, 360-367. [Ruakura Animal Res. Stat., New Zealand Dept. Agric., Hamilton.]

Five groups of fattening lambs were compared: castrated with elastrator at birth, with elastrator at 3 weeks, with knife at 3 weeks, with emasculator at 3 weeks, and not castrated. At slaughter carcass weights, measurements and grades were recorded.

Between groups there was no difference in any of the measurements, weights or proportions. In grading all castrated groups were equal but the entire animals were inferior, owing to poorer fat development. Subsidiary observations on mortality and disease also showed no difference between groups, and it was concluded that the different methods, if efficiently applied, are equally satisfactory as regards effects on carcass quality.

T. D. Bell.

3922

ROBINSON, J. F. **Survey of Blackface sheep with special reference to their hardiness. A report to the Scottish Hill Farm Research Committee.** H.M.S.O., Edinburgh, 1953, pp. 68. Price 2s. 6d. [Animal Breeding Res. Organiz., Edinburgh.]

Evidence submitted to the Hill Farm Research Committee in 1944 suggested that the decline in the numbers of hill sheep since the late nineteenth century was in part due to a deterioration in health and hardiness, and the main object of the survey was to obtain evidence of any change in the constitutional hardiness of Blackface sheep and, if such were found, to relate it to conditions responsible, such as changes in the sheep or in the ground or in the methods of breeding and management. Information was gained through personal visits, questionnaires and flock records for some 130 hill flocks representative of the main Blackface areas in Scotland south of the Caledonian Canal. Flock records going back 20 to 70 years were examined area by area, and the following conclusions were drawn.

In general the breeders thought that recent changes in type to the more compact fleece and body are proving beneficial. They were critical of the tendency to breed the Lanark type too big or to carry the reduction of fleece too far. The present tendency to judge Blackfaces more by

size, fancy points and carriage and to overlook qualities such as compactness and condition were deprecated and it was thought that if those methods are continued they may result in too long a body with narrow chest and loin, and so with loss of constitution and mutton qualities. The heavy feeding of tups by the tup breeders was deprecated. Though there was no clear-cut evidence that the use of these tups led to any loss of hardiness in the flocks, the mortality in the tups themselves was over 10 per cent. in average years. Over the years no evidence of loss of hardiness could be found through the level of stocking, prolificacy or mortality of ewes and lambs, nor was there evidence to suggest any deterioration in characters which make for survival in exceptionally severe winters.

The report contains useful tables of stocking rates, lambing percentages and mortality, and these demonstrate the profound influence of climate from area to area and year to year.

A further 20 visits made to breeders of Blackfaces and Swaledales in Northeast England revealed some evidence of a deterioration of Blackfaces, though not in mortality rate, since 1900, particularly in the Weardale area, where they have been replaced by Swaledales. This was thought to be partly due to using the wrong type of Blackface for this "harder" area. Lamb crops of Blackfaces were somewhat less than in South Scotland, and less than those of Swaledales. Swaledales suffered more severe losses than Blackfaces in the very severe winter of 1946-47.

W. Thomson.

3923

SMITH, R. G. C. **Wintering Blackface ewe hogs. A further report on a Glensaugh experiment.** *Scot. Agric.*, 1953-54, **33**, 140-144. [N. Scotland Coll. Agric.]

The results of trials from 1949 to 1952 showed that ewe hogs wintered on reseeded low-lying hill pasture were in no way inferior to comparable sheep sent away for wintering on lowland pastures. Liveweight increases, lambing performances and wool production were compared. The only significant difference between the treatments was in the cost, those wintered at home being very much cheaper. (See Abst. 5654, Vol. 19 for the report of similar trials in 1944-48, of which these are a continuation.)—T. D. Bell.

3924

EDMUNDS, H. **Home wintering of hill lambs.** *Agriculture, J. Minist. Agric. Engl.*, 1954, **60**, 513-517. [Breconshire.]

On this farm at an elevation of 1150 ft. improvement in the cultivable land by the application of adequate lime and fertilisers and reseeded has

enabled all lambs to be wintered at home instead of having to be sent to lower ground as formerly. It has also been possible to grade some wether lambs off the hill and to increase the cattle and sheep stocks.—W. Thomson.

3925

Les problèmes de l'élevage ovin au Maroc. [**Problems of raising sheep in Morocco.**] *Zootechnia*, 1953, **2**, 363-372. [Serv. Élevage, Morocco.] Spanish and German summaries.

The position of sheep rearing in Morocco is critical. Common land is used, and overstocking has resulted in deterioration of pastures, which are insufficient for maintenance. Immediate action is necessary. Some research on the introduction of new forage crops and the improvement of those existing has already been done, and awaits general application. Suggested measures for the solution of the whole problem are the reduction of total stock, and particularly of the goat population, protection of pastures by correct management and consequent improvement of the stock reared, both

by selective breeding and as a natural result of better conditions. The necessary steps to be taken, and those which have already been taken by the authorities, are enumerated and discussed.

T. D. Bell.

3926

WALLACE, L. R. **Management of the fat lamb flock.** *Proc. Ruakura Farmers' Conference, Hamilton, N.Z.*, 1953, 55-63 (with discussion 63-64).

3927

IRVING, M. **Environmental factors affecting nutrition in sheep.** *J. Dept. Agric. S. Austral.*, 1953, **57**, 135-136. [Dept. Animal Husb., S. Australian Dept. Agric.]

3928

LAMBOURNE, L. J. **Rotational grazing of ewes and lambs.** *Proc. Ruakura Farmers' Conference, Hamilton, N.Z.*, 1953, 37-42 (with discussion 42-43).

See also Absts. 2956-58.

PIGS

3929

BECKER, D. E., ULLREY, D. E. and TERRILL, S. W. **A comparison of carbohydrates in a synthetic milk diet for the baby pig.** *Arch. Biochem. Biophys.*, 1954, **48**, 178-183. [Dept. Animal Sci., Univ. Illinois, Urbana.]

The carbohydrates, which made up 57 per cent. of the dry matter of the diet, were dextrose, lactose, sucrose, dextrin and maize starch. In the first test all of them were compared, with 7-day-old pigs. Rates of growth were greater, but not significantly so, on lactose and dextrin. The efficiency of feed conversion was significantly greater on lactose than on glucose or maize starch. On sucrose 3 of the 8 pigs died with severe diarrhoea but the survivors were almost as efficient as the lactose group.

The second test, with pigs of the same age as in the first, showed that an equal mixture of lactose and maize starch was slightly better than lactose alone and much better than maize starch alone.

In 2 further tests with 1- and 2-day-old pigs all those given sucrose died after 96 hr. on the diet, with severe diarrhoea and loss of appetite just before death. Control pigs given dextrose thrived.

T. D. Bell.

3930

BERGE, S. and INDREBØ, T. **Milk production by sows.** [Mjølkeproduksjon hos purker.] *Meld. Norges Landbrukshøgsk.*, 1953, **33**, 389-423. [Norges Landbrukshøgsk.] Norwegian summary.

The literature is reviewed and the technique and results of investigations are reported.

It was found that the quantity of milk secreted depended mainly on the size of the litter, sows with the larger litters giving more milk, but piglets in the smaller litters got more milk per head. The interval between sucklings is also important. When left to themselves, piglets suckled 20 times a day. In these investigations they suckled every hour, and milk production was about 50 per cent. higher than that found by other workers. The daily milk yield was less in the first week of lactation, and greatest in the fifth week, declining again towards the end.

During the third and fourth weeks the growth rate of piglets declined, but this could not be explained in terms of the amount of milk they were receiving. The highest rate of gain per kg. milk was during the first 2 weeks, and the lowest during the third and fourth. After that supplementary feed influenced the rate of gain. There was a high correlation between daily milk production and daily growth of litters.

Chemical analysis showed that colostrum was lower in fat and higher in total solids, particularly protein, than later milk, the average composition of which was: total solids 17.5, fat 6.1, protein 5.4, sugar 5.9 and ash 0.8 per cent.—T. D. Bell.

3931

EVANS, R. E. **Nutrition of the bacon pig. 17. The nutritive value of condensed fish solubles.**

N.A. and R., July 1954

J. Agric. Sci., 1954, **44**, 100-120. [Sch. Agric., Univ. Cambridge.]

A series of growth and nitrogen balance trials were made to investigate the value of condensed whale and fish solubles as sources of protein and as animal-protein factor (APF) supplements. Though the solubles are high in crude protein ($N \times 6.25$) only one-third of the N is true protein. The solubles were compared with white-fish meal, and in all experiments the diets supplied equal total digestible nutrients.

No evidence was obtained that the solubles given as 3 or 4 per cent. of an all-vegetable ration, in which the protein was supplied by soya bean meal, groundnut meal or dried brewer's yeast, acted as a source of APF, but it is possible that the lack of response was due to the pigs having body reserves carried over from the suckling period, or being able to synthesise APF.

When crude protein equivalent to 7 per cent. white-fish meal was supplied, the nutritive value of the crude protein of the fish solubles was inferior to that of the white-fish meal. This was shown in both growth and N balance trials. But the fish solubles were useful as a protein supplement for cereal grains. The unpalatability of the solubles, observed throughout the trials, may have contributed to its inferiority to white-fish meal.

T. D. Bell.

3932

GOBBLE, J. L. and MILLER, R. C. **Soft phosphate with colloidal clay in rations for swine.** *Pennsylvania Agric. Exp. Stat. Progr. Rep.* No. 93, February 1953, pp. 4.

Soft phosphate with colloidal clay is a residue from the mining of rock phosphate in Florida. It contains Ca 15 to 20, P 9, F 1.5 per cent., and may contain appreciable amounts of trace elements.

In feeding trials with pigs from weaning to slaughter at 290 lb. liveweight, 3 groups of 5 pigs each were given the same ration, except that in the first group the supplementary P was supplied by standard dicalcium phosphate and in the other two by soft phosphate and colloidal clay. The groups did not differ significantly in rate of liveweight increase, efficiency of feed utilisation, percentage ash in bone, percentage Ca and P in bone or inorganic P in blood. One of the soft phosphate groups received trace elements in addition, but with no apparent advantage. There was significantly more F in the bones of the soft phosphate groups, but there was no evidence of F poisoning, and the F level was not considered dangerously high.—T. D. Bell.

3933

TEAGUE, H. S. and HANSON, L. E. **The effect of feeding different levels of a cellulosic material**

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to swine. *J. Animal Sci.*, 1954, **13**, 206-214. [Nebraska Agric. Exp. Stat.]

Three experiments were made with 24 individually fed, newly weaned pigs to test the effect on growth and digestibility of the nutrients of the ration of adding Ruffex, a cellulose preparation from rice straw, at levels of from 5 to 20 per cent. to a basal ration of maize starch, casein, lard, brewer's yeast, minerals and cod liver oil. Some of the pigs were slaughtered at 100 lb. and others at 200 lb.

The Ruffex up to a level of 10 per cent. had little effect on growth but higher levels adversely affected growth and feed utilisation, although there was considerable variation. Carcase characteristics were not affected. At levels of 15 and 20 per cent. Ruffex, the apparent digestibilities of the crude protein, ether extract and N-free extract were reduced. The digestibility of the Ruffex was poor and variable, with a tendency for more to be digested as the level was raised.—J. S. Thomson.

3934

DAMMERS, J. Varkensproef met het "Ergona-mestpreparaat". [Tests with pigs with the Ergona fattening preparation.] *Veeteelber.*, 1951, **5**, 1590; *Versl. Veren. Exploitatie Proef-zuivelboerderij Hoorn*, 1951-1952.

There are Ergona preparations, manufactured in Germany, for milk and egg production, for fattening and for growth. They are said to contain plant extracts in homeopathic quantities and consist, to the extent of 98 per cent., of calcium carbonate.

The fattening preparation was tested in an experiment with 3 groups of 6 pigs on a ration of cereals and whey, the second group like the first fed to appetite and the third on the same ration in restricted amount. The second and third groups had 20 g. Ergona per head daily. The pigs weighed about 75 kg. at the beginning of the test, after 70 days roughly 126, 131 and 111 kg., when the third group was returned to ordinary feeding and the other 2 groups transferred to a low-protein ration with a little grass. At 118 days their mean weights were 91.4 and 88.5 kg. There was no advantage in any respect from giving Ergona.—I. Leitch.

3935

ŠEVKOVIĆ, N. Uticaj animalne belančevine na korekciju uobičajenog obroka kod svinja u porastu. [Effect of animal protein in correcting an ordinary ration for growing pigs.] *Acta vet., Belgrade*, 1953, **3**, 145-149. [Inst. Tierernährung, Univ. Belgrade.] German summary.

Animal protein was given as boiled fresh horse-meat. The basal ration was a grain mixture of

maize, oats, barley and bran, with a little potato and 2 per cent. of CaCO_3 , a common ration in Jugoslavia.

The experimental group of pigs required 2.96 kg. feed per kg. gain as against 3.46 kg. in the control group. The importance of correcting the existing feeding practice and the financial advantage of such correction are urged.

S. Pribičević (Jugoslavia):

3936

HEWITT, A. C. T. **Feeding trials with whale solubles.** *J. Dept. Agric., Victoria*, 1954, **52**, 23-30; 36.

The whale solubles consisted of a black viscous liquid containing moisture 45 to 50, crude protein 42 to 48, crude fat 1 to 2 and mineral matter 4 to 5 per cent. It was mixed with the meals, and in one instance lumps had to be ground in a hammer mill because the pigs refused it.

Two trials with pigs of initial liveweight 30 lb. and 2 with pigs of 50 lb. were made to compare meatmeal and whale solubles as protein supplements to a cereal meal and alfalfa ration for growing and fattening. In 3 trials there were 3 groups, one getting meatmeal, one a mixture of meatmeal and whale solubles, and one whale solubles. In the fourth trial the second group was omitted. The protein supplement was about 8 per cent. of the ration.

With the lighter pigs the efficiency of feed conversion and rate of liveweight increase were not as good in the whale solubles group as in the other two, but there was no difference in dressing percentage or carcass appraisal. The same tendency was found in the heavier pigs, but the differences were slight.

Laying hens on grain and mash, with half or all the meatmeal in the ration replaced by whale solubles, put on more weight but laid fewer eggs in a 162-day period than those getting meatmeal only. Cannibalism was worse in the whale solubles groups.—T. D. Bell.

3937

VORSTER, T. H. **The effect of Lederle Aurolac on the growth of pigs.** *Rhodesia Agric. J.*, 1953, **50**, 375-378.

Lederle Aurolac containing not less than 1.89 g. of aureomycin hydrochloride and 1.8 g. of vitamin B_{12} activity per lb. was added to the ration of pigs from weaning to bacon weight at the rate of 5 lb. per ton feed. A control group had no Aurolac supplement. The basal ration was white maize meal 65, groundnut cake meal 12, cottonseed cake meal 10, wheat bran 7, fishmeal 5 and bone-meal 1 per cent., and green alfalfa was also given. The pigs were slaughtered at 180 to 190 lb. liveweight. The experimental group gained slightly

faster and were slightly more efficient in feed utilisation than controls, but the differences were not significant. There was no difference in carcass grade, but the dressed carcass weights were significantly higher in the experimental group. There was a saving of 5s. 8½d. per pig, and it is concluded that Lederle Aurolac must cost less than 5s. 9½d. a lb. to be economically worth while.—T. D. Bell.

3938

RUSSELL, L. and McClymont, G. L. **Antibiotics for stimulating growth in pigs.** *Agric. Gaz. N.S.W.*, 1953, **64**, 604-605.

Aureomycin in the ration of pigs for 122 days after weaning increased growth rate by 25 and efficiency of feed conversion by 8.3 per cent. compared with controls. Procaine penicillin did not improve performance in any way. There is a general discussion on the advisability or otherwise of using antibiotics, with reference to the stimulation of growth in runt pigs.—T. D. Bell.

3939

BARBER, R. S., BRAUDE, R. and MITCHELL, K. G. **Antibiotics and endocrine stimulants as promoters of growth in fattening pigs.** 2. *Chem. and Indust.*, 1954, No. 3, 76. [Nat. Inst. Res. Dairying, Univ. Reading.]

In continuation of experiments previously reported (Abst. 5253, Vol. 23), feeding trials were made to study the growth-promoting effects of L-thyroxine and an antibiotic, but no stilboestrol. There were 6 groups of 9 pigs each, of average initial liveweight 46 lb. They were fed for 16 weeks on a basal meal of fine wheat offals 50, barley meal 30, flaked maize 10 and white-fish meal 10 parts by weight, as a wet mash, given according to liveweight, with the following supplements: 0.3 mg. L-thyroxine; 1.1 g. Aurolac 2A; 5 mg. procaine penicillin; 0.3 mg. L-thyroxine and 1.1 g. Aurolac 2A; 0.3 mg. L-thyroxine and 5 mg. procaine penicillin. A control group had no supplement.

All the antibiotic and combined supplements significantly increased the rate of liveweight gain and efficiency of feed utilisation as compared with the control group, but the differences between the antibiotics and the combined supplements were not significant, though the results indicated that the addition of L-thyroxine did tend to improve performance. Further work is in progress.

T. D. Bell.

3940

DAMMERS, J. **Proeven over het gebruik van antibiotica voor mestvarkens.** [Experiments in the use of antibiotics for fattening pigs.] Centraal Veevoederbureau in Nederland, 1953, pp. 15. English summary.

N.A. and R., July 1954

Four experiments were made with fattening pigs. In the first, 0.1 per cent. of U.S.I. antibiotic feed supplement containing 5 g. bacitracin per lb. failed to increase the rate of gain or feed efficiency when added to a ration containing sufficient animal protein. In other experiments in which the ration contained all-vegetable protein, 0.25 or 0.5 per cent. of Aurofac, containing 1.8 g. aureomycin per lb., gave an 8 to 16 per cent. increase in growth rate and a 9 per cent. increase in feed efficiency. When the ration contained animal protein the increases were only 3 to 6 and 2 to 4 per cent., respectively. Similar results were obtained with terramycin. It is considered that antibiotics are effective for pigs in poor condition during the first half of fattening but that it is advisable to limit the application of antibiotics until more is known about their effect on the organism and of their continued use in successive generations. [From summary.]—W. Godden.

3941

FLETCHER, J. L. and BARRENTINE, B. F. **Antibiotic supplementation of corn-cottonseed meal rations for growing pigs.** *J. Animal Sci.*, 1954, **13**, 201-205. [Mississippi Agric. Exp. Stat.]

Five trials with pigs receiving aureomycin or penicillin supplements are reported. In all trials the basal ration was of maize, cottonseed meal, alfalfa meal and minerals, and 0.5 per cent. ferrous sulphate was included to prevent any toxic effect of cottonseed meal. Aureomycin was given at the rate of 6.8 or 13.6 mg. per lb. feed and penicillin at 2 mg. per lb.

In 2 trials with the lower level of aureomycin, growth rate and efficiency were increased; in a third, growth rate decreased but efficiency was better. The higher level decreased both growth rate and efficiency. The pigs in this trial were somewhat heavier than those in all other trials. In the 2 trials with penicillin growth rate and efficiency were increased. Both supplements contained vitamin B₁₂, and the response may have been partly due to this.—T. D. Bell.

3942

WALLACE, H. D., MILICEVIC, M., PEARSON, A. M., CUNHA, T. J. and KOGER, M. **The influence of aureomycin on the protein requirement and carcass characteristics of swine.** *J. Animal Sci.*, 1954, **13**, 177-183. [Dept. Animal Husb., Florida Agric. Exp. Stat.]

In a trial with 54 pigs of 40 lb. weight 3 levels of protein were compared, and at each level half the pigs were given 20 g. aureomycin supplement per 100 lb. feed. The levels of protein were 14.3, 17.6 and 20.9 per cent. up to 100 lb. liveweight,

and then 11.7, 14.3 and 17.6 per cent. to slaughter weight. The ration was of ground yellow maize, expeller soya bean meal, alfalfa leaf meal and minerals.

The low-protein group with aureomycin made slightly greater daily liveweight increases, but there was no significant difference between groups. In efficiency of feed conversion the medium protein group was best. Aureomycin improved performance only in the high-protein group.

Hb level was significantly higher in the medium- and high-protein groups, and aureomycin raised Hb in all groups, though not significantly.

At low and high protein levels dressing percentage was higher in the aureomycin groups, but the reverse was true in the medium groups. Between protein levels the differences in dressing percentage were significant: the high level dressed lower than the others. Aureomycin increased backfat thickness. The highest carcass grade was found in the high-protein group without aureomycin.

T. D. Bell.

3943

BRATZLER, L. J., SOULE, R. P. (Jr.), REINEKE, E. P. and PAUL, P. **The effect of testosterone and castration on the growth and carcass characteristics of swine.** *J. Animal Sci.*, 1954, **13**, 171-176. [Dept. Animal Husb., Michigan Agric. Exp. Stat.]

There were 6 groups of 40 lb. pigs, all self-fed on rape pasture and concentrates. The treatments were: (1) castrated at the beginning of the experiment; (2) as (1) and implanted with 193 mg. testosterone propionate; (3) castrated at live-weight 100 lb.; (4) at 140 lb.; (5) at 180 lb. live-weight; (6) left entire.

There was no difference between groups in daily rate of gain or efficiency of feed conversion. Groups 1, 2 and 3 had higher dressing percentages, owing to thicker backfat. Groups 4, 5 and 6 were longer in the body. Groups 5 and 6 had significantly higher percentages of preferred cuts and lean meat in the loin. In palatability, however, group 6 was much below the other groups. Castration as late as 5 weeks before slaughter (group 5) was considered adequate to eliminate the offensive properties of boar meat.

Kidney weights were greater the later castration was done, and greatest in the intact boars. This applied to weights of accessory sex glands also. The implantation of testosterone was without effect.—T. D. Bell.

3944

MUIR, W. R. **Problems in providing high-energy rations for pigs and poultry.** *Proc. Nutrition Soc.*, 1954, **13**, 23. [Res. Dept., J. Bibby and Sons, Ltd.]

- 3945
BOLKHOVITINOV, N. Z. [Special rate of growth of young Kalikin pigs, and different types of "menus" for them.] *Sovet. Zootekh.*, 1953, 8, No. 3, 63.

- 3946
SHAFRAN, A. M. [Feeding ensilage to pigs.] *Sotzial. Zhiv.*, 1952, 14, No. 12, 15.

- 3947
KOVALENKO, N. A. [Fattening 4-10-month-old pigs on maximum rations of sugar beet and potatoes.] *Sovet. Zootekh.*, 1953, 8, No. 3, 52.

- 3948
SAMARTSEV, M. I. [The use of hay meal in fattening porkers and baconers.] *Sotzial. Zhiv.*, 1952, 14, No. 12, 27.

- 3949
PYAL'ZING, E. G. [Fattening pigs on food waste.] *Sotzial. Zhiv.*, 1952, 14, No. 11, 19.

- 3950
PANOV, A. [Fattening pigs on food waste.] *Sovet. Zootekh.*, 1953, 8, No. 3, 94.

- 3951
DUCKWORTH, J. Economies in pig and poultry feeding. *Proc. Nutrition Soc.*, 1954, 13, 31-37. [Rowett Res. Inst., Bucksburn, Aberdeenshire.]

- 3952
TAKETOMI, M., NIWA, T. and ONISHI, N. [A statistical consideration on the litter-size in

swine, with special reference to its repeatability.] *Bull. Nat. Inst. Agric. Sci., Chiba, Japan* [G], 1953, No. 7, 147-152. In Japanese: English summary.

This is a statistical analysis of data for 635 litters of Middle White, Berkshire and Poland China pigs, from the breeding and farrowing records of pigs at the National Institute of Agricultural Sciences during 1927 to 1951. In all breeds litter size in the first litter was smaller than in successive litters. The general conclusion is that the hereditary difference should be less than 26 per cent. of the intra-breed variance. [From summary.]—W. Godden.

- 3953
TAKETOMI, M., NIWA, T. and ONISHI, N. [On the heritability of bodyweight in pigs.] *Bull. Nat. Inst. Agric. Sci., Chiba, Japan* [G], 1953, No. 7, 153-160.

Data from the records of Middle White pigs at the National Institute of Agricultural Sciences collected over the periods 1929 to 1939, 1940 to 1942 and 1943 to 1948 were examined. They included the number of boars and sows used and the bodyweight of the pigs at birth and at 1, 2 and 6 months of age. In the first period all the boars except one were imported, but in the subsequent periods their descendants were used. Feeding and management were satisfactory in the first 2 periods but in the third were adversely influenced by the war. Differences in birthweight in all 3 periods were slight, but bodyweights at 1, 2 and 6 months of age were much lower in the period 1943-1948. The results indicate that the worse the environmental conditions, including feeding, the more clearly were the genetic differences seen. [From summary.]—W. Godden.

See also Absts. 2829, 3103, 3110, 3175, 4018.

GOATS, RABBITS AND OTHER MAMMALS

- 3954
RYASHCHENKO, L. P. [The effect of feeding *Laminaria* on the antlers of Spotted Deer.] *Karakul. i. Zver.*, 1953, 6, No. 2, 61.

Male spotted deer were found to eat *Laminaria* quite readily; of 8 test animals only 2 were not keen on it. Large quantities, up to 13 kg. per head daily, produced no abnormality of the intestinal tract. Continuous feedings with dried *Laminaria* at the rate of 1.29 kg. per head daily led to a good increase in bodyweight of the deer but decreased the growth of the antlers. The weight of antlers from test animals was 10.7 per cent. less than that from controls; when the antlers were stored this difference increased to 13.5 per cent. [From summary.]—W. Hughes.

- 3955
MORRIS, M. L. Nutritive requirements of the cat. *Vet. Med.*, 1953, 48, 451-456; 1954, 49, 85-86. [Topeka, Kans.]

Thirteen male castrate well nourished cats were each given 135 g. daily of a "freshly-prepared raw meat-like" diet, and the weight of feed refused was measured. After 7 days, and for the following 11 days, this diet was withdrawn and replaced by 148 g. of a "carefully balanced but sterilised canned product", with a slightly different moisture content. The change did not cause significant changes in feed consumption or bowel movement.

Average daily energy consumptions were 53.8 Cal. for the raw and 43.1 for the canned diet.

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Ash consumptions and excretions in the urine, both per 100 g. feed consumed, were, respectively, 1.8 and 0.81 g. for the raw, and 0.82 and 0.41 g. for the canned rations.

It is considered that these data may throw some light on the problem of urinary diseases associated with mineral deposits.—W. A. Greig.

3956

WOOLEY, J. G. **Growth of three- to four-week-old rabbits fed purified and stock rations.** *J. Nutrition*, 1954, 52, 39–50. [Nat. Inst. Arthritis Metabol. Dis., Nat. Inst. Health, Bethesda, Md.]

Groups of rabbits weaned at 3 to 4 weeks old and weighing 350 to 500 g. were fed to appetite for 4 weeks on a purified diet 1395 previously found satisfactory for 8-week-old rabbits by Wooley and Sebrell (Abst. 1354, Vol. 15) or on a purified diet 1436 similar to that found satisfactory by Reid and Briggs (Abst. 3515) for guineapigs. Other groups received these diets in which 40 per cent. of dried kale leafmeal replaced portions of the sugar, starch, fat and protein in the diets. A control group was fed on stock pellets.

Diet No. 1395 did not support good growth in the young animals but the introduction of 40 per cent. of kalemeal produced considerable stimulation of growth. Other vegetables were also effective but not to the same extent. After the first week the rabbits on stock pellets, diet 1395 with kale and diet 1436 with or without kale exhibited the same rate of growth. The addition of 0.2 per cent. of K as carbonate or acetate to diet 1395 stimulated growth but not to the same extent as the kalemeal.

Preliminary experiments indicated that with casein as the source of protein 25 per cent. is necessary in the diet for young rabbits but that equally good results are obtained at the 20 per cent. protein level if part of the casein is replaced by kalemeal.—W. Godden.

3957

BORTOLI, O. **Effetti della somministrazione di idrolizzato di corna sulla lana del coniglio d'Angora.** [The effect of administration of hydrolysates of horn on the wool of the Angora rabbit.] *Riv. Zootec.*, 1954, 27, 87.

As a source of cystine, a hydrolysate of horn, 0.5 g. for 40 days and 1.0 g. for a further 50 days, was given to adult Angora rabbits. A control group of the same strain received no supplement. All animals were plucked at the beginning of the experiment, and the wool grown was weighed after 90 days. There was a slight advantage of 1.52 per cent. in the experimental animals compared with controls, and the sulphur content of the wool was increased. Supplementation had no effect on liveweight, and all animals remained in good health.

There were only 12 animals in each group. Increases of 5.61 per cent. have been observed in castrated animals, and the matter requires further investigation.—T. D. Bell.

3958

MATRONE, G., WELDON, V. B., SMART, W. W. G. (Jr.), SHERWOOD, F. W., SMITH, F. H. and WISE, G. H. **Effects of phosphate fertilization and dietary mineral supplements on the nutritive value of soybean forage.** *J. Nutrition*, 1954, 52, 127–136. [Dept. Animal Indust., N. Carolina Agric. Exp. Stat., Raleigh.]

Soya bean hay, prepared by barn drying from crops grown in 2 different seasons with and without phosphatic fertilisers, were used. In both seasons the fertiliser caused a larger increase in the yield of dry matter per acre, a decrease in the percentage of leaf in the whole plant and an increase in the percentages of Ca and P in the dry matter. The rations given to 4-week-old, newly weaned rabbits were, per cent.: hay 76, cerelese 13, cottonseed oil 5 and egg albumin 6. The hays from the second-year crop were also given with and without the addition of 0.75 per cent. CaHPO_4 to the ration. The rabbits on the rations containing the unfertilised hay showed smaller liveweight gains over 7 or 11 weeks and had a lower serum inorganic P and their femurs had greater fragility and lower sp. gr. than those of rabbits receiving the fertilised hay. The addition of CaHPO_4 to the low-P forage ration eliminated these differences and gave greater liveweight gains than did a similar addition to the high-P forage ration.—W. Godden.

See also Abst. 2987.

POULTRY

GROWTH AND FATTENING

3959

GIULIANI, R. **Le esigenze nutritive dei polli secondo le attuali conoscenze nel campo della nutrizione animale. 4.** [Nutritive requirements of poultry according to present knowledge in the field of animal nutrition. 4.] *Riv. Zootec.*, 1954, 27, 1–5.

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3960

FANGAUF, R., KLEIN, F. W. and BARLÖWEN, G. v. **Über den Kochsalzanteil im Kükenallein-futter.** [Sodium chloride in all-mash rations for chicks.] *Arch. Geflügelk.*, 1954, 18, 33–36. [Lehranst. Kleintierzucht, Kiel, Steenbek.] English summary.

Four groups of 40 Single Comb White Leghorn

chicks were reared for 8 weeks on an all-mash ration to which was added 0.6, 1.0, 2.0 or 3.0 per cent. NaCl. Greatest growth was obtained at the 0.6 level. There was no effect on mortality, which was low in all groups. Raising the salt level increased water consumption and the moisture content of the droppings.—W. Godden.

3961

FRÖLICH, A. Kvalitetsbedömning av sojamjöl med laboratoriemetoder och i försök med kycklingar. [Assessing the quality of soya bean meal by laboratory methods and in chick experiments.] *Kgl. Lantbruksakad. Tidskr.*, 1953, **92**, 367–378. [Statens Husdjursförsök, Upsala.] English summary.

The dual problem of treatment of soya bean meal so as to destroy its antiproteolytic activity without denaturing its protein is outlined. Three samples of solvent-extracted meal, from the same dealer but probably not from the same factory, were tested for antitryptic activity, urease activity and water-soluble protein by formol titration and absorption of phenolphthalein, as received and after autoclaving for 20 or 60 min. at 1.5 atm. and 121° C. All samples were tested also in chick growth experiments. Two samples had been insufficiently heated in the first place and autoclaving for 20 min. raised their value to about that of the third sample in the chick experiments. There was a close correlation between laboratory and biological grading, especially with the phenolphthalein test. Details of it will be published elsewhere.—I. Leitch.

3962

ALMQUIST, H. J. and MERRITT, J. B. Accentuation of dietary amino acid deficiency by raw soybean growth inhibitor. *Proc. Soc. Exp. Biol. Med.*, 1953, **84**, 333–334. [Grange Co., Modesto, Calif.]

A diet with a marginal tryptophan content, containing 15 per cent. protein from meat scrap and 5 per cent. protein from raw soya bean meal, was given to chicks. Very much better growth was obtained if 0.2 per cent. L-tryptophan was added, though not as good as that resulting from heating the soya bean meal, the average weights at 28 days being 131, 254 and 354 g., respectively.

The experiment of Hill *et al.* (Abst. 5283, Vol. 23) was repeated with methionine and arginine instead of the mixture of 11 amino-acids, to procure a better balance of amino-acids, and a growth period of 28 days instead of 7, to avoid effects due to continued assimilation of yolk. The average weights at 28 days of chicks on the basal diet, on the basal diet with methionine and arginine, and on the basal diet containing heated soya bean

meal were 247, 307 and 316 g., respectively, in contrast to the findings of Hill *et al.* that added amino-acids had no effect.—C. Warner.

3963

FISHER, H., SCOTT, H. M. and HANSEN, R. G. Further studies on the alfalfa factor and its relation to the liver and whey factors. *J. Nutrition*, 1954, **52**, 13–24. [Dept. Animal Sci., Illinois Agric. Exp. Stat., Urbana.]

In extension of earlier work (Absts. 5276, 5277, Vol. 23) it is shown that alfalfa meal, defatted whole liver and dried whey each contain separate and distinct growth factors for chicks which are additive in their action. Of the 3 supplements alfalfa meal gave the greatest and most consistent response, which could not be explained on the basis of the alfalfa meal's content of ash, critical amino-acids or glucuronic acid.

W. Godden.

3964

DAVIS, G. K., MEHRHOF, N. R., DRIGGERS, J. C. and DENNISON, R. A. Dehydrated celery tops in chick rations. *Florida Agric. Exp. Stat. Circular S-37*, October 1951, pp. 6.

In experiments extending over 3 years dehydrated celery tops, a waste product from the vegetable growing industry, were given to chickens at levels of from 3 to 11.3 per cent. of an all-mash basal diet and growth was compared with that on the basal diet with 6 per cent. alfalfa leaf meal.

Up to 10 weeks of age there was no significant difference between the groups in growth, mortality or efficiency of feed conversion.

On a moisture-free basis celery was higher than alfalfa meal in Ca, P, Mn and carotene, but up to 45 per cent. of the carotene may be lost after 5 months' storage.—J. S. Thomson.

3965

O'NEIL, J. B. and BELL, J. M. "Feed-Ani" as a ration component for poultry and livestock. *Canad. J. Agric. Sci.*, 1954, **34**, 36–40. [Dept. Poultry Husb., Univ. Saskatchewan, Saskatoon.]

"Feed-Ani" is a naturally occurring mineral deposit obtained in Nevada, U.S. It contains about 80 per cent. silica compounds, about 0.3 per cent. F and traces of the "essential" minerals.

Experiments with chicks showed that their growth was depressed by an amount roughly equivalent to the dilution of the feed by "Feed-Ani" added at a rate of 2 per cent.

In a test with mice, feed consumption increased on the average by 13 per cent. but no improvement in weight gain was noted. "Feed-Ani" caused a significant decrease in feed efficiency.

Further studies with poultry are in progress.

P. C. Jowsey.

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3966

SLINGER, S. J., HAUSER, M. M. and PEPPER, W. F.
The correlation between feed consumption and fecal flora in chicks. *J. Nutrition*, 1954, **52**, 75-88. [Dept. Poultry Husb., Ontario Agric. Coll., Guelph.]

A group (A) of 18 chicks was housed in a wire-floored cage and fed to appetite from day-old to 7 weeks on a ration containing 6 per cent. animal products, 28 per cent. soya bean meal and supplementary methionine. A similar group (B) received the same treatment but with a dietary supplement of 15 mg. procaine penicillin G per kg. Two further groups (C and D) received the same treatments, but with their feed intake restricted to that of group A for the first 4 weeks of the trial.

At 4 weeks of age the mean liveweights of the groups were 394, 431, 376 and 377 g., respectively. Feed consumption of group B, whether expressed "per chick" or "per 100 g. bodyweight", was higher than that of group A, over the first month. At 7 weeks of age the mean weights of the 4 groups were 939, 1036, 933 and 959 g., respectively. When growth was calculated on a logarithmic basis for the period from 4 to 7 weeks of age it was only 1 per cent. greater for group B than for group A.

In the first 4 weeks of the trial mixed daily samples of droppings were taken from each group, and bacteriological examinations were made of these after serial dilution in a number of different media. The counts of coliform bacilli in the droppings of group B remained consistently higher than those of group A from the 8th to the 20th day. Some differences were noticed in the counts of enterococci and lactobacilli in different groups, but they were less consistent.

It is suggested that penicillin stimulates chick growth by causing an increase in feed consumption early in the life of the bird, and that this is associated with an increase in the "coliform" count in the droppings.—K. J. Carpenter.

3967

JACOBS, R. L., ELAM, J. F., ANDERSON, G. W., GEE, L. L., FOWLER, J. and COUCH, J. R.
Further evidence as to the possible mechanism involved in the growth-promoting responses obtained from antibiotics. *J. Nutrition*, 1953, **51**, 507-513. [Dept. Biochem., Texas Agric. and Mech. Coll. System, College Station.]

A group of 25 chicks kept from day-old to 10 weeks in a wire-screen cage in a scrupulously clean room, and fed on a ration of soya bean meal 35, minerals 4, vitamins and yellow maize meal to 100, finished with a mean liveweight of 1200 g. Two further groups received similar treatment with the addition to their ration of either 4.4 p.p.m. penicillin or 11 p.p.m. chloromycetin. The final

weights of these groups did not differ significantly from that of the first group.

In a second trial under similar conditions, the following antibiotic supplements were used (with the concentrations in p.p.m. in parenthesis): penicillin (4.4, 11, 110), erythromycin (4.4), bacitracin (11), aureomycin (11), penicillin (1.1) plus bacitracin (2.75) plus aureomycin (2.75) plus terramycin (2.75), furazolidone (55), furazolidone (28) plus penicillin (2.2), *p*-chlorophenylarsonic acid (100), and *p*-chlorophenylarsonic acid (50) plus penicillin (2.2). None of the groups receiving any of these supplements was significantly heavier than the control group, which again finished with a mean weight of 1200 g.

Estimations of the number of clostridial organisms in the faeces of the different groups were made by a technique used in earlier trials (Abst. 5289, Vol. 23). In the present experiments the mean concentrations per g. of faeces ranged from 400 to 2900 for the different groups, and differences were not significant. In the earlier trials, where antibiotics had stimulated growth, the control birds had given faecal concentrations of 46,000, and the supplemented birds of 12,000 clostridia per g. It is suggested that the antibiotics act by reducing the harmful effects of clostridia when these are present in the alimentary tract in high concentrations.—K. J. Carpenter.

3968

FANGAUF, R., FANGAUF, K. W. and BARLÖWEN, G. v.
 Untersuchungen über den Bedarf an tierischem Eiweiss und den Einfluss der Antibiotika auf das Wachstum der Eintagsküken. [Requirement of animal protein, and the effect of antibiotics on the growth, of day-old chicks.] *Arch. Geflügelk.*, 1954, **18**, 49-65. [Versuchsanst. Kleintierzucht, Kiel, Steenbek.] English summary.

Seven experiments with groups of day-old chicks lasting 8 weeks each are reported. In all experiments the control groups received a ration containing 8 per cent. fishmeal and 8 per cent. soya bean meal. In other groups the amount of fishmeal was reduced and the protein content kept constant by altering the amount of soya bean meal. Some groups received in addition 10 mg. penicillin, streptomycin or terramycin with or without 26 µg. vitamin B₁₂ per kg. feed.

In the absence of antibiotics and vitamin B₁₂ the chicks required 4 to 6 per cent. fishmeal in the ration for optimum growth and feed utilisation. With a supplement of antibiotic and vitamin B₁₂, 2 per cent. fishmeal sufficed. When fishmeal was entirely omitted optimum growth was not obtained even with the antibiotic and vitamin supplements. Antibiotics stimulated the growth of the chicks and their feed utilisation even with

rations containing 8 per cent. fishmeal. In one experiment with penicillin, 6 mg. per kg. of basal ration gave better growth and feed utilisation than 3 mg. Levels of terramycin up to 300 mg. per kg. had no harmful effect on growth.—W. Godden.

3969

CUTHBERTSON, W. F. J. and GLASSER, H. **The use of procaine penicillin in the production of table poultry under practical conditions in the United Kingdom.** *J. Sci. Food Agric.*, 1954, **5**, 153-156. [Glaxo Laboratories, Ltd., Greenford, Middlesex.]

Two experiments were made, with 1107 day-old Brown Leghorn \times Light Sussex and 2100 day-old Rhode Island Red \times Light Sussex cockerels. In each, half of the birds received an unsupplemented basal ration and the rest were given 5 g. procaine penicillin per ton feed. In the first test chicks were weighed at 7 and 15 weeks of age and in the second at 3 and 7 weeks and also when sold at 16 to 18 weeks.

In the first experiment the total yield of table poultry at 15 weeks of age was 2308 lb. from 549 chicks given the basal ration alone and 2605 lb. from 558 chicks given penicillin. The increase in yield, about 11 per cent., was attributable to improved growth and to the lower number of culls.

In the second experiment the total yield in the unsupplemented group was 4521 lb. and in the penicillin group 4822 lb., both from 1050 birds. The birds reached the required weight, $5\frac{1}{2}$ to $5\frac{1}{2}$ lb., in 15.8 weeks when given penicillin and in 17.3 weeks without supplement.

Statistical analysis of the data showed that the gains were highly significant and are summarised by the statement that growth improved by 8.6 per cent. (fiducial range 6.2 to 11.0 per cent., $P = 0.95$), and average cull rate fell by 6.3 per cent. (fiducial range 2.76 to 9.52 per cent., $P = 0.95$), giving a total increase in output in a given time of 15.4 per cent. (fiducial range 11.3 to 19.7 per cent., $P = 0.95$).—P. C. Jowsey.

3970

MEHNER, A. **Aufzucht auf Tiefstreu. [Rearing on deep litter.]** *Arch. Geflügelk.*, 1954, **18**, 12-21. [Inst. Tierzucht., Landw. Hochsch., Hohenheim.] English summary.

In continuation of earlier work (Abst. 1114, Vol. 23), 4 further experiments, each lasting 8 weeks, are reported in which groups of birds were reared on deep old poultry manure, a mixture of equal parts of old poultry manure and cow manure,

or normal deep litter. It was found to be possible to use old poultry manure as litter and get good liveweight gain and feed utilisation and as low a mortality rate among the chicks as on normal litter. There was some evidence of better liveweight increase and lower mortality on manure that had been stored for up to 2 years, and a lower incidence of coccidiosis.—W. Godden.

3971

FANGAUF, R. and BARLÖWEN, G. v. **Wachstumseffekt bei Nitrofurazon-Gaben. [Effect of Nitrofurazone on growth.]** *Arch. Geflügelk.*, 1954, **18**, 29-32. [Lehranst. Kleintierzucht, Kiel, Steenbek.] English summary.

Nitrofurazone mixed at the rate of 0.00625 per cent. in the feed of day-old chickens increased the growth rate over a period of 8 weeks, provided vitamin B₁₂ was present in the diet. The effect was more marked when animal protein was reduced in or removed from the diet. The drug may be regarded as a preventive of coccidiosis with a growth-promoting effect.—W. Godden.

3972

FLEURET, P. H. **La production du foie gras de volaille destiné à la consommation. [Production of birds' fatty liver destined for consumption.]** *Ann. Nutrit. Alimentation*, 1953, **7**, C 97-C 124 (with discussion C 124-C 131).

See also Abst. 2918, 2922, 3030, 3075, 3104, 3105, 3107, 3116, 3309.

EGG PRODUCTION

3973

MACINTYRE, T. M. and JENKINS, M. H. **A study of the effect of the fineness of grinding grains on the efficiency of all-mash rations for laying hens.** *Canad. J. Agric. Sci.*, 1954, **34**, 10-17. [Dominion Exp. Farm, Nappan, N.S.]

Three all-mash rations of the same composition but ground to 3 different degrees of fineness were given to groups of Barred Plymouth Rock hens housed in pens or batteries. Weight gains, egg production and weights, feed consumption and feed efficiencies were estimated.

The only difference noted was that hens given finely ground mash ate less and had better efficiencies of feed conversion.

When presented with a choice between the 3 rations, the hens showed a preference for coarsely ground feed.—P. C. Jowsey.

See also Abst. 2936, 3936.

OTHER BIRDS

3974

POSPELOV, S. M. O pitanii i khozyaistvennom znachenii sinits, pishchukhi i malogo pestrogo dyatla. [The nutrition and economic importance of *Parus* spp., *Aegithalos caudatus*, *Certhia familiaris* and *Dendrocopos minor*.] *Zool. Zh.*, 1953, 32, 283-287. [Kaf. Lesn. Entomol., Lesotekh. Akad. Im. C.M. Kirova.]

The survey on these birds was made over a period of 2 years in the Leningrad district. The number of stomachs examined ranged from 38 for *Parus atricapillus*, L. to 3 for *Dendrocopos minor*, L. A detailed account is given, but particular attention was paid in the analysis to the presence of insects and their larvae harmful from the silvicultural point of view, which for the 5 species listed amounted to 60, 27.5, 93.6, 75 and 13.6 per cent., respectively, of the total.—D. W. Taylor.

3975

KUMARI, A. R. Pitanie zolotistoi rzhanki i znachenie ee v usloviyakh lesnoi zony rasprostraneniya. [The nutrition of *Pluvialis apricarius* and its importance in the conditions of expansion in forest regions.] *Zool. Zh.*, 1953, 32, 288-293. [Inst. Biol., Akad. Nauk Estonsk. S.S.R.]

An analysis was made of the stomach contents of 80 specimens of *Pluvialis apricarius* (Golden plover) inhabiting the marshy country of western Estonia and its environs. The diet consisted mainly of Coleoptera, Lepidoptera harmful to crops, and in particular of *Plateumaris sericea*, *Sericus brumeus* and *Corymbites sjaelandicus*, and the larvae of the last 2 species.

D. W. Taylor.

FOOD ECONOMICS AND STATISTICS

3976

BOSWORTH, T. J. Control of livestock diseases in Britain: some reflections on the present situation. *Proc. Roy. Soc. Med.*, 1954, 47, 23-26.

The present situation in control of scheduled diseases and programmes for the eradication of non-scheduled diseases is described. Though progress is being made, e.g., in the establishment of tuberculin-free herds, now representing 42.5 per cent. of our cattle population, "the losses caused by livestock disease in the United Kingdom have been estimated at £80 million per annum or about 15 per cent. of the total livestock of the country". We cannot afford this. More should be spent on research, and some reorganisation is necessary for the acquisition of new, and the application of existing, knowledge.—T. D. Bell.

3977

HOLMES, W. Self-sufficiency on the dairy farm. Some economic aspects. *Scot. Agric.*, 1952, 32, 83-90. [Hannah Dairy Res. Inst., Kirkhill, Ayr.]

3978

USUELLI, F. Produzioni agrarie e zootecniche e situazione demografica. [Agricultural and animal production and the demographic situation.] *Riv. Zootec.*, 1954, 27, 33-37; 75-80.

The problem of the pressure of growing population in a world already overpopulated in relation to its capacity to produce food is discussed. Erosion, caused by the rapacity of man, is blamed for the unproductive state of a large part of the earth's surface, and in spite of the great progress

already made, the scientist cannot, within the foreseeable future, be expected to satisfy our needs with synthetic foods. For the present we must depend on agriculture and apply our existing knowledge to make ends meet.

The situation outside Europe, in Russia, the rest of Asia and Australia is outlined. Neither South and Central nor North America can hold out hopes for the future. In the former overpopulation already exists, and particularly in Central America the land is still being robbed. In North America, in spite of enormous production at present, the future is menaced by the rate of erosion. In general the answer to the problem is in recognition of the fact that we must co-operate with nature and maintain and improve agricultural production.

The outlook in Italy is not good, owing partly to bad distribution of available food. The population is likely to increase and birth control is not effective against this possibility. The answer lies in increased production from the land, care and improvement of plants and stock, and wider consumption of products which are in abundance.

T. D. Bell.

3979

HJELM, L. Lantbrukets lönsamhetsutveckling under efterkrigstiden. [Economics of agriculture since the war.] *Kgl. Lantbruksakad. Tidskr.*, 1953, 92, 333-348. English summary.

In Sweden the total produce of agriculture has increased since 1945 by roughly 10 per cent. This is due chiefly to oilseeds and almost entirely to the continued extension of crop acreages arising from

the elimination of 160,000 horses, and improvement in yields per acre by greater use of fertilisers. The number of cows has been reduced by 250,000, but total milk yield is little changed. Sheep have been reduced to half and pigs have somewhat increased. Mechanisation has greatly increased, so that the return for labour has also increased.

Farm income is analysed in relation to district, size of holding, and type of production. Wages are still below those of industrial workers, but farmers with 10 to 20 hectares or more of land are better off than before.—I. Leitch.

3980

ARESVIK, O. Nyere retningslinjer innen landbruksøkonomien. [Recent trends in agricultural economics.] *Tidsskr. norske Landbruk*, 1954, **61**, 33–52.

A discussion of techniques in agricultural economics.

3981

TRESCHOW, A. Lanthushållningen under 1900-talets första hälft. Utblickar och erfarenheter från ett storjordbruk i Mälardalen. [Husbandry during the first half of the 20th century. Prospects and results from a large farm in the Mälar valley.] *Kgl. Lantbruksakad. Tidsskr.*, 1953, **92**, 429–473.

3982

SUOMELA, S. Karjattoman maanviljelyn taloudellista edellytyksistä suomessa. [The economics of farming without cattle in Finland.] *Maataloust. Aikakausk.*, 1953, **25**, 193–222. [Res. Inst. Agric. Econ., Helsinki.] English summary.

3983

BREIREM, K. Futtermittel aus Fischen und Seetieren. [Feedingstuffs from fish and sea animals.] *Futter und Fütterung*, 1953, Nos. 34, 35, pp. 8.

This is a brief general account of the Norwegian fishmeal industry, with data for the output, composition and nutritive value of the different grades of products.—W. Godden.

3984

IMPER, A. D. and HAUGHS, M. A. Report on the production of milk 1952–53. Aberdeen and District Milk Marketing Board area. *North of Scotland Coll. Agric., Agric. Econ. Dept. Rep.* No. 27, February 1954, pp. 19.

Forty herds in the Aberdeen, Banff and Kincardineshire area were costed, 24 for the fourth year in succession. Herd average, including dry cows, was 45, range 10 to over 69, and farm size varied

from 49 to 740 acres. Average yield was 842 gal. compared with 814 for 1951–52. Including a herd replacement of 27 per cent., winter production costs were £48 11s. 11d. per cow and 2s. 4d. per gal.; 21½ weeks' summer grazing cost £32 4s. 2d. and 1s. 5½d. per gal., giving an annual average of 1s. 11½d. per gal. Grazing costs were £5 13s. 1d. per acre or 5s. 1d. per cow weekly. Annual costs per cow varied from £60 to £110 and herds with highest yields generally produced milk most cheaply, though they used more purchased foods.

W. Thomson.

3985

CAMBRIDGE UNIVERSITY SCHOOL OF AGRICULTURE, FARM ECONOMICS BRANCH. Profitable milk production. 1. Some problems of milk production on arable farms. *Farmers' Bull.* No. 15, January 1954, pp. 28. Price 2s. 6d.

The present position of the milk producer is discussed and conditions in 1951–52 are compared with those in 1938–39. Though wages increased by 213 per cent. labour cost per gal. had, through greater efficiency, increased by only 146 per cent., and though the cost of purchased concentrates increased by 317 per cent. the actual cost of these per gal. increased by only 83 per cent. owing to the greater use of homegrown foods. In 40 herds the profit per cow at 1938–39 purchasing power was £14 16s. for 1938–39 and £15 16s. for 1951–52. Aspects of costs and profits in relation to herd size, yield and seasonal peak period are discussed. It is concluded that milk on the mixed arable farm is in a relatively less favourable position than formerly, owing to decreasing opportunities for adjustment and more competition from other farming enterprises; and that, since the liquid milk market is now satisfied, further price stimuli can hardly be expected.

W. Thomson.

3986

Travaux et recherches sur le lait et les produits laitiers. [Work and research on milk and milk products.] *Lait*, 1953, **33**, 615–621.

3987

DOLVEN, A. Aktuelle spørsmål i avl og omsetning av matpoteter. [Present problems in the production and marketing of ware potatoes.] *Tidsskr. norske Landbruk*, 1953, **60**, 263–276.

This lecture describes the importance of the potato in Norwegian agriculture, its uses and measures to improve marketing. The potato takes more than 20 per cent. of the total acreage under cereals and vegetables; yet the food market is neglected in favour of the industrial and seed potato markets. A modern installation for cleaning, sorting, grading and packing potatoes is described.—I. Leitch.

3988

- HUMPHRIES, H. R. **The changing world supply of animal feeding-stuffs.** *Proc. Nutrition Soc.*, 1954, **13**, 2-6. [Animal Feeding Stuffs Div., Minist. Food, Dean Bradley House, Horseferry Rd., London, S.W.1.]

3989

- ASKEW, W. R. and BRENSIKE, V. J. **The mixed-feeds industry.** *U.S. Dept. Agric. Marketing Res. Report No. 38*, May 1953, pp. 24. [Bur. Agric. Econ., U.S. Dept. Agric., Washington, D.C.]

DIET IN ETIOLOGY OF DISEASE

GENERAL

3990

- PUNTRIANO, G. O. **Urinary calculi in livestock—a new concept of its etiology and possible prevention with hyaluronidase.** *J. Amer. Vet. Med. Assoc.*, 1954, **124**, 55-62. [State Vet. Lab., Laramie, Wyo.]

Ultramicroscopic studies of the urine of sheep and cattle showed that in both there is a complex of colloids and crystalloids held dispersed in a fluid phase. In healthy subjects, most of the crystalloid structures are coated by accumulations of colloidal material which presumably prevent the growth of the crystals, such colloids being termed hydrophilic or protective. Other urinary colloidal material (hydrophobic) has the property of aggregating into clumps in the presence of electrolyte, if not prevented from doing so by the presence of an adequate concentration of protective colloids; when this is inadequate, not only is protection diminished but the low concentration of hydrophilic colloids actually enhances the clumping tendencies of hydrophobic colloids, thus leading to the opposite of protection, called "sensitisation".

It is postulated that colloid-crystalloid balance may be influenced by such conditions as mineral and fluid intake, and by environmental stresses. In steers affected with urolithiasis, the urine exhibited subnormal colloidal activity and surface tension. It is shown that subcutaneous administration of hyaluronidase to healthy animals not only raised these values, but also reduced urinary turbidity, and this suggests that its continued use (as by subcutaneous pellet implantation) might prove of therapeutic value in urolithiasis, provided that the dose was adequate; inadequate dosage might well be actually harmful, by producing sensitisation.—W. A. Greig.

3991

- BEVERIDGE, W. I. B. and JOHNSTONE, I. L. **Sheath-rot, non-contagious posthitis or chronic ulceration of the prepuce of sheep. 2. Experiments on the reproduction of the disease.** *Austral. Vet. J.*, 1953, **29**, 329-336. [Div. Animal Health Prod., C.S.I.R.O., McMaster Animal Health Lab., Sydney.]

Attempts to transmit sheath-rot, by transferring material from established lesions to the prepuces

of healthy sheep, all failed; nor was it possible to produce the disease by mechanical means such as occlusion of the preputial orifice or local irritation.

From a series of 13 feeding experiments it was found that a high-protein leguminous diet rapidly produced external ulcers, as did a diet low in Ca and high in phosphate; but typical sheath-rot only occasionally ensued. These results are not considered conclusive, but it is held that sheath-rot is mainly dietetic in origin, and that it may result from irritation by urine in which there is ammoniacal fermentation of the nitrogenous constituents. These conditions would be set up by alkaline urine rich in urea following a high-protein leguminous diet.—W. A. Greig.

3992

- SMITH, W. S. **The disease effects of the under-nourished ewe.** *J. Dept. Agric. S. Austral.*, 1953, **57**, 144-148.

3993

- HANCOCK, J. **Bloat in relation to grazing behaviour.** *Proc. Ruakura Farmers' Conference, Hamilton, N.Z.*, 1953, 203-215 (with discussion 215).

3994

- NICHOLS, R. E. **Why do cows and sheep bloat?** *Vet. Med.*, 1954, **49**, 91-95. [Madison, Wis.]

3995

- CLARKE, E. A. **Rickets in hoggets.** *Proc. Ruakura Farmers' Conference, Hamilton, N.Z.*, 1953, 44-53 (with discussion 53-54).

See also Absts. 2938, 2967, 2969, 2973.

DEFICIENCY DISEASES

3996

- SENIOR, B. J., SHEEHY, E. J., O'SULLIVAN, G. F. and O'DONOVAN, J. **Blood copper deficiency in Offaly cattle.** *Sci. Proc. Roy. Dublin Soc.*, 1954, **26**, New Ser., 263-273. [Dept. Animal Nutrit., University College, Dublin.]

Poor conditions, scouring and stunting were found in phosphate-deficient areas in Offaly. The affected animals readily responded to ⁵⁹Cu sulphate in solution, although in some cases 3 or 4 drenches were necessary. Blood samples were

taken before treatment, and Cu values were found to be low. On adjacent unaffected farms the values were normal. When the herbage from affected and unaffected farms was analysed there was no significant difference in Cu content, but the Mo content was high on the affected farms.

T. D. Bell.

3997

WOLBACH, S. B. and HEGSTED, D. M. **Perosis: epiphyseal cartilage in choline and manganese deficiencies in the chick.** *Arch. Pathol.*, 1953, **56**, 437-453. [Div. Nutrit. Res., Div. Labs. Res., Child. Hosp., Boston, Mass.]

Groups of chicks were given control, Mn-deficient or choline-deficient diets from 4 days of age. By the 14th day distinctive changes in the epiphyseal cartilages were well established in birds of both deficient groups. Addition of 0.1 per cent. Mn or 0.3 per cent. choline to the diets prevented the occurrence of lesions.

The skeletal lesions were typical of perosis and were exactly similar in both deficiencies, suggesting that Mn and choline meet in a common biochemical system. The changes followed from retardation or suppression of epiphyseal cartilage sequences, so that endochondral bone growth was affected. Changes were profound, beginning with failure of the cartilage cells to reach maturity and followed by retarded tunnelling and an abnormal matrix in the zone of growth. Later changes involved all zones of the cartilage, and included actual reduction of mitoses in the zone of proliferation. There was no apparent interference with osteogenesis, and consequently the columns of cartilage in the endochondral region almost completely disappeared. It is considered that the term perosis should be reserved for skeletal abnormalities involving these distinctive changes in the epiphyseal cartilage.—W. A. Greig.

3998

JOVANOVIĆ, M., PANTIĆ, V. and MARKOVIĆ, B. **[Enzootic goitre of domestic animals in PR Serbia.]** *Acta vet., Belgrade*, 1953, **3**, 31-51. [Inst. Pathol. Physiol., Fac. Vet. Med., Univ. Belgrade.] In Russian: English summary.

In areas where the inhabitants suffer from goitre, hypothyroidism was observed in domestic stock also.

The incidence of enlarged thyroids and the degree of enlargement were greatest among goats, but other signs, such as dwarfism, sterility and low vitality, were not seen, though poor lactation was reported where enlargement was found.

In sheep the enlargement of the thyroid was not so pronounced, but poor lactation and wool production, and high mortality rate in lambs, were noted.

The percentage of enlarged thyroids in cattle was similar to that in sheep, but disorders thought to be due to hypothyroidism were reported, including poor condition of young stock, and sterility, poor milk yield, short lactation, and too frequent silent heats in cows.

Among pigs little abnormality was seen, but pig-breeding is not highly developed in this area.

Goitre occurred also in horses, less in foals than adults, and though the more primitive breeds showed a higher incidence, imported thoroughbred stallions seemed to suffer more than homebred. Affected animals were less able to work, and stallions had decreased sexual impulse. In affected foals general condition was good while they were young, but they did not develop normally, and were often stunted.

Goitre has been reported also in dogs. (From summary.)—T. D. Bell.

See also Absts. 2917, 2937, 2956-59, 2971, 3025.

DISEASES OF METABOLISM

3999

BARTLETT, S., BROWN, B. B., FOOT, A. S., ROWLAND, S. J., ALLCROFT, R. and PARR, W. H. **The influence of fertiliser treatment of grass-land on the incidence of hypomagnesaemia in milking cows.** *Brit. Vet. J.*, 1954, **110**, 3-19. [Nat. Inst. Res. Dairying, Shinfield, Reading.]

In April 1952, 22 milking cows were turned out directly from winter feeding to a superphosphate-dressed sward of cocksfoot and clover, divided into 3 plots. Plot A had been treated with magnesite and sulphate of ammonia, plot B with sulphate of ammonia alone, and plot C with sulphate of potash. The animals were watched for a few weeks and samples of blood were taken at least twice weekly for Mg and Ca estimations. Samples of the herbage on each plot also were chemically analysed.

The following year a similar procedure was adopted with 20 cows. The whole field had received more superphosphate, and in addition plot A had received more sulphate of ammonia but not more magnesite. Plot B had been split into B₁, treated this year like plot A, and B₂, which received no further dressing. Plot C had received more potash and the dominant clover had been suppressed with a hormonal spray.

Taking the 2 years together, none of the 9 cows on plot A showed signs of grass tetany and only 1 showed a substantial drop in serum Mg. Of 15 cows on plots B (1952) and B₁ (1953) 11 had very low serum Mg levels, and, of these, 2 died suddenly and 5 others developed typical grass tetany. In 4 others given supplementary concentrates the serum Mg did not fall so low. On plot B₂ (1953), the serum Mg of the 4 cows remained

N.A. and R., July 1954

at or near normal levels, as did that of the 4 cows on plot C in 1952. But in 1953, in 3 of 4 cows on plot C (with less Mg-rich clover) serum Mg fell to low levels. In general, all serum Ca values remained in the normal range, although in most animals showing signs of grass tetany serum Ca fell 2 or 3 days earlier.

The nitrogenous fertiliser increased the crude protein content of the herbage, and the Mg content of the herbage on the magnesite-treated plot was substantially higher than that from the other plots, especially in the second year. Nevertheless, the Mg content of the sward on all plots was more than adequate by accepted standards.

In these experiments low serum Mg was found almost exclusively where the sward contained little clover, and, although clover contains more Mg than does grass, the lack of direct correlation between serum Mg and the Mg content of the sward suggested that there may well be some complication and that the disease results from dysfunction of the physiological mechanism controlling serum Mg, not from direct dietary deficiency; by boosting the daily Mg intake to high levels, however, frank disorder can be prevented.

W. A. Greig.

4000

McAULIFF, J. L., PHILLIPS, W. V. and STEELE, J. R. **Treatment of ketosis in dairy cattle: a clinical report.** *Vet. Med.*, 1954, **49**, 69-74; 88. [Armour Vet. Labs., Chicago, Ill.]

Over a period of a year, 45 cows in New York State diagnosed as affected with ketosis, the criteria being clinical evidence with blood sugar less than 40 mg. per cent. and blood ketones more than 10 mg. per cent., were treated with Adrenomone, a proprietary product prepared by Armour Veterinary Laboratories. This form of treatment was instituted on the supposition that ketosis involves derangement of the pituitary-adrenal balance. In some animals ketosis was complicated by other disorders, but the degree of success achieved was judged by the ketone content of the urine and, in some, by blood sugar and ketone levels.

Of the 45 cows, 30 recovered, 13 improved and the remaining 2 gave good responses. Only 8 animals required continuation of treatment beyond the third day.—W. A. Greig.

See also Abst. 3243.

POISONS OCCURRING IN FOOD

4001

NAFTALIN, J. M. and CUSHNIE, G. H. **Pathology of bracken poisoning in cattle.** *J. Comp. Pathol.*, 1954, **64**, 54-74. [Rowett Res. Inst., Bucksburn, Aberdeenshire.]

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A diet containing 60 per cent. dried bracken was given to 8 heifers; for 4 of them the ration was made up with 40 per cent. hay, and for the other 4 with 20 per cent. hay and 20 per cent. molasses. Four control heifers received 60 per cent. grass and 40 per cent. hay. A further 3 heifers were given 60 per cent. sun-dried bracken and 40 per cent. hay for 9 weeks and were then offered fresh bracken only. To one of these a complete vitamin B supplement was daily administered subcutaneously; to the second 50 mg. vitamin B₁₂ was given daily for about 12 weeks, followed by amounts up to 250 mg. twice daily. The third heifer received no vitamin supplement.

All the animals fed on bracken lost condition and died in from 38 to 92 days, the control heifers remaining well. Neither the molasses nor the vitamin supplements influenced the course of the disease or the post-mortem findings.

Early signs of the disease were the appearance of large numbers of squamous epithelial cells in the urine, followed shortly by blood. In one animal these signs appeared after only 6½ weeks. Heart beats slowed to 40 or 50 per min., often within a week or two of the commencement of bracken feeding, but rose sharply a few days before death. At this time rectal temperature, which had remained within normal limits until then, rose to 105° to 107° F., the rise coinciding with the development of a non-specific bacteraemia. Body-weight was maintained on the dried bracken diets, but diminished when fresh bracken was introduced.

The main haematological finding was progressive diminution in the number of circulating white cells and platelets. In the terminal stages the leucocyte count dropped to about 1000 cells per c.mm., all of them lymphocytes. When the platelet count fell below 40,000 per c.mm. the clot failed to retract.

Post-mortem examination revealed multiple haemorrhages throughout the carcase. Their degree and exact location varied from animal to animal, but the tissues affected included the subcutaneous tissues, fascial planes, muscles, serosae, subserosae, mucosae and submucosae. Organs affected included the rumen and the whole of the alimentary tract, the liver, gall-bladder, spleen, kidneys, ureters and bladder, heart and lungs. Histologically the haemorrhages were either associated with bacterial infarcts (liver, kidney, lung, spleen and muscle) or were perivascular as in thrombocytopenia (alimentary and urinary tracts). The bone marrow was pale, with a large decrease in cell numbers. Myeloid cells and megakaryocytes were almost completely absent, with erythroid cells also, though less severely, diminished.

It is concluded that the essential lesion in bracken poisoning is bone marrow damage leading to a diminution in the numbers of circulating

platelets and granulocytes. Subsequently there are multiple haemorrhages and bacterial invasion of the bloodstream. The cause of the bone marrow damage remains obscure, but it is suggested that the damage may result from depletion of some substance synthesised by the micro-organisms in the rumen, or from a toxic material either in bracken itself or formed by these micro-organisms as the result of altered metabolism.—W. A. Greig.

4002

NAFTALIN, J. M. and CUSHNIE, G. H. **Experimental bracken poisoning in calves.** *J. Comp. Pathol.*, 1954, **64**, 75-86. [Rowett Res. Inst., Bucksburn, Aberdeenshire.]

Five calves aged from 62 to 105 days were fed on either fresh or dried bracken. A sixth calf fed on grass was studied as a control. Three of the bracken-fed calves developed the typical syndrome of bracken poisoning after 29 to 37 days. The lesions were identical to those in adult animals (preceding Abst.), the most primitive myeloid and erythroid cells in bone marrow being those most affected. Once formed, mature polymorphs appeared to be unaffected.

The other 2 bracken-fed calves died suddenly from heart failure on the 23rd and 29th days without rise in temperature or haemorrhage, but they also had severe bone marrow damage. One of these had been given 250 mg. vitamin B₁ twice daily by mouth from the beginning of the experiment.

It is concluded that the typical syndrome of bracken poisoning in the adult also develops in calves given bracken, if they live long enough.

W. A. Greig.

4003

MORAN, E. A. **Cyanogenetic compounds in plants and their significance in animal industry.** *Amer. J. Vet. Res.*, 1954, **15**, 171-176. [Pathol. Div., Bur. Animal Indust., U.S. Dept. Agric., Washington, D.C.]

4004

HENDERSON, F. G., HARRIS, P. N. and CHEN, K. K. **Hepatotoxic action of *Senecio longilobus*.** *J. Pharmacol. Exp. Therap.*, 1954, **110**, 26. *Proc.* [Lilly Res. Labs., Indianapolis, Ind.] Experiments with dogs and sheep.

4005

HOWES, J. R. **A taint in cows' milk caused by the grazing of *Ischaemum aristatum* L.** *Trop. Agric., Trinidad*, 1953, **30**, 224-227. [Imperial Coll. Trop. Agric.]

IMMUNITY

4006

WHITTEN, L. K. and MACFARLANE, I. M. **The effect of monthly anthelmintic treatment on the growth of young sheep rotationally grazed on hill pastures.** *N.Z. Vet. J.*, 1953, **1**, 150-153. [Dept. Parasitol., Wallaceville Animal Res. Stat., Palmerston North.]

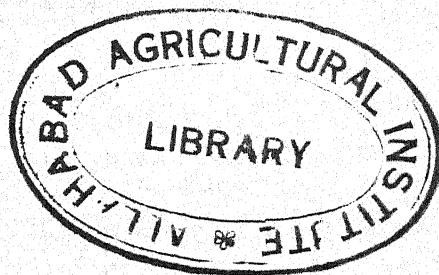
Observations on the weight gains and helminth egg counts of 150 weaned lambs on rotational grazing are described. The paddocks were rested for 3 to 4 weeks before they were grazed again. There were 3 groups of 50 lambs which were grazed together. Group A received 20 g. phenothiazine per lamb at monthly intervals; group B received 28 ml. of 2 per cent. copper sulphate and nicotine sulphate per lamb at monthly intervals; group C was untreated. Groups A and B showed significantly better weight gains than the control group and group A showed better weight gains than group B.

The egg counts of the control group rose rapidly in February and March, maintained a high level in April and May and fell in June. Group B showed a similar but much smaller rise starting in March. Group A maintained a low level without any significant rise.—G. C. Hunter.

4007

GERRIETS, E. **Experimentelle Untersuchungen über die gesundheitsfördernden Eigenschaften der Altstreuverfahren bei der Kükenaufzucht.** [Experimental studies of the beneficial effects of deep litter in rearing chicks.] *Arch. Geflügelk.*, 1954, **18**, 21-28. [Abt. Geflügelk., Humboldt Univ., Berlin.] English summary.

Two groups of chicks were raised on sawdust litter, changed regularly, and two on built-up old horse manure. One group on each bedding was infected with *Salmonella pullorum*. The mortality in the non-infected groups was 12 and 11 per cent. and in the infected 79 and 76 per cent., respectively. No benefit occurred from the use of built-up litter (cf. Abst. 2605, Vol. 24).—W. Godden.



7. BOOK REVIEWS

4008

BALSTON, J. N. and TALBOT, B. E. **A guide to filter paper and cellulose powder chromatography.** H. Reeve Angel and Co., Ltd., London, 1952, pp. 145. Price 8s.

4009

HARRIS, R. S., MARRIAN, G. F. and THIMANN, K. V. (Eds.) **Vitamins and hormones. Advances in research and applications. Volume 11.** Academic Press, Inc., New York, 1953, pp. ix + 356.

4010

HUDSON, C. S. and WOLFROM, M. L. (Eds.) **Advances in carbohydrate chemistry. Volume 8.** Academic Press, Inc., New York, 1953, pp. xvii + 408.

4011

ANSON, M. L., BAILEY, K. and EDSALL, J. T. (Eds.) **Advances in protein chemistry. Volume 8.** Academic Press, Inc., New York, 1953, pp. ix + 529.

4012

HOLMAN, R. T., LUNDBERG, W. O. and MALKIN, T. (Eds.) **Progress in the chemistry of fats and other lipids. Volume 2.** Pergamon Press, Ltd., London, 1954, pp. 347. Price 63s.

4013

WUHRMANN, F. and WUNDERLY, C. **Die Bluteiweisskörper des Menschen. [The blood proteins of man.]** Benno Schwabe and Co. Verlag, Basle, 1952, pp. 387. Geb. Fr. 42.

This book is a second edition, largely rewritten, of a monograph first published in 1947. The first chapter of 50 pages is a survey of the chemistry and physiology of the plasma proteins. This is followed by sections on the qualitative and quantitative estimation of proteins in general and the fractionation of plasma proteins in particular. The clinical laboratory techniques related to plasma proteins are discussed and described in great detail. This covers, with many other tests, the Takata reaction, the thymol turbidity test, and related reactions. The main part of the book (over 200 pages) deals with the clinical significance of plasma protein analysis and plasma protein reactions.

The authors draw on extensive personal experiences and have provided a very comprehensive and competent survey of the field. There are full

references to original papers, reviews and monographs. The presentation tends to be lacking in conciseness but this is a minor point. The book is without doubt a most valuable and unique source of information.—H. A. Krebs.

4014

BACH, S. J. **The metabolism of protein constituents in the mammalian body.** The Clarendon Press, Oxford, 1952, pp. viii + 272. Price 40s. [Dept. Physiol., Univ. Bristol.]

The past decade has seen a very rapid development of the knowledge of amino-acid metabolism. A monograph collecting and sifting the mass of information is therefore very timely. The present volume deals with the biochemistry of alanine, glycine, serine, threonine, valine, leucine, *iso*-leucine, cystine and cysteine, and methionine; a second volume is planned to cover the remaining protein constituents. The treatment is limited to the purely biochemical aspects. The organic chemistry of amino-acids is rightly omitted.

The author has made an exhaustive and critical study of the literature and condensed in this book a large volume of widely scattered information. All ramifications of the metabolism of individual amino-acids are dealt with. The chapter on glycine alone, for example, covers 61 pages and includes a detailed discussion of the synthesis of hippuric acid, nicotinuric acid, porphyrins, uric acid, bile salts, creatine and serine. More than half the book is occupied by the sulphur-bearing amino-acids.

It is a special merit of the book that the historical development of the subject is very adequately presented. The monograph will prove invaluable to advanced students and to workers in the field.

H. A. Krebs.

4015

BENNETT, M. K. **The world's food. A study of the interrelations of world populations, national diets, and food potentials.** Harper and Brothers, New York, 1954, pp. vi + 282.

In chapter 1 of this book the "terrifying" picture is drawn of population growth as it might have been if man had ever reproduced to full capacity. The important upsurge of population dates from about 1650 and economic advancement, which connotes sanitation, warmth, drugs, transport and, possibly, improvement of man's morals, has provided the lift. Chapter 2 reviews rapidly and brightly the dispersion of man and foods over the earth and the history of diet, with the suggestion, only half apologised for, that the upsurge of population in the seventeenth century could not

have occurred without the dispersal of American food plants to the rest of the world. There is a vivid sketch of the shocks of weather and plagues of insects and the European famine of 1315. The third chapter discusses Malthus and the neo-Malthusian in the sensible light that "arithmetic carries in itself no element of prediction, no element of compulsion". Society can, if it will, choose what birth rates and food supplies it will have, if it also chooses to avoid war and economic autarky.

Part 2, chapters 4 to 11, is occupied with a semi-technical and economic account of the American national diet. Part 3, with 5 chapters, reverts to subjects of more general interest; world geography of hunger, the relation of consumption to income, and food in war time.

FAO is thought to overassess "hunger", even if hunger be interpreted to include lack of the full measure of any one of the known essential components of diet. Of those roughly classified as "hungry", most "may be quite unconscious of living an abnormal existence". Certainly this is true. Underemployment in agriculture and low activity connote low food intake; the extremely poor or the primitive do not recognise deficiency disease as such. But unconsciousness of these admitted abnormalities does not justify our indifference to them. FAO judges hunger, not in relation to existing states only, but in relation to such improvement as is agreed to be desirable. FAO, in the guise of an "inspired leader", is counselled to seek confirmation on medical grounds for the association of malnutrition with poverty and relative lack of foods other than starchy staples. But this is almost the *pons asinorum* of nutrition theorems and WHO, no less than FAO, has accepted it. On occasion it seems to be forgotten that FAO works with estimates of food supplies made by the supporting countries of which some do little more than provide an incentive to improve.

The whole treatment of the subject is intelligent and critical. No one will question that the "peasant logic which calls for submission to adversity if it comes, not for anticipatory outlay of effort when nobody knows whether adversity will or will not come" exists. I suppose it will always be an impediment to progress, and not only among peasants. It is also, in its own way, a safeguard. The general thesis, in spite of the criticism, is in accord with the principles on which FAO was founded and now works. There are many details that could be argued, and many arguments that could be debated at length. The book is provocative and perhaps therefore all the more valuable when so many books on the same subject are only dull or irritating. Teachers of nutrition should greatly welcome it.—I. Leitch.

4016

FINNEY, D. J. **An introduction to statistical science in agriculture.** Oliver and Boyd, Edinburgh, 1953, pp. 179. Price 25s.

The preface states that this book has grown from a course of 8 lectures given to agricultural students at Oxford. It is to such that it is directed, and in its aim to show the foundations of statistical science and its application to agricultural problems, it contains a minimum of mathematics. Many worked examples are included, but their intention is to illustrate the principles rather than to act as a guide to computational methods.

There are 9 chapters dealing with probability, distributions and their uses, design, sampling, regression and correlation. Included amongst these is a most instructive chapter describing in detail the steps taken in conducting a simple experiment. Finally, a valediction containing some simple and sensible rules is included. If these were distributed to all workers about to embark on an experiment they might well save many post-operative pains.

In fine, the book achieves its stated intentions admirably, and should be available to every agricultural student, if not on his bookshelf on account of its high price.—A. W. Boyne.

4017

SEN, K. C. **Animal nutrition research in India.** Macmillan and Co., Ltd., Calcutta, 1953, pp. xii + 370. Price 25s.

This is one of a series of critical monographs to be published under the auspices of the Indian Council of Agricultural Research in which it is designed to set forth the results obtained by Indian workers and to compare them with the results of workers in the same fields in other countries.

The present review opens with a short chapter giving an outline of agriculture and animal husbandry in India. There follow chapters dealing with the composition, digestibility and nutritive value of Indian feedingstuffs, conservation of fodders, poisonous plants and the effects of vitamin and other deficiency diseases. The animals mainly studied have been cattle or buffaloes, although there are brief references to work with sheep and goats. It is appropriate, therefore, that the last and longest chapter should be devoted to investigations in dairy science concerned mostly with cow or buffalo milk, its composition, handling and processing, and the nutritive value of the milk and its products. The discussions are amply illustrated by tables and graphs of experimental results and at the end of each chapter a full bibliography is given. The author states that he has used his discretion in selecting topics of research for inclusion but, nevertheless, the book furnishes a good

N.A. and R., July 1954

picture of the progress of nutritional research as related to animals in India in recent years.

W. Godden.

4018

DAVIDSON, H. R. **The production and marketing of pigs.** Longmans, Green and Co., London, 1953, 2nd ed., pp. xvi + 537. Price 40s.

The first edition of this book was reviewed in Abst. 1642, Vol. 19. For the second edition some details in the text have been revised, but there is no change in the general presentation, which covers in considerable detail every aspect of pigkeeping. Some recent developments in nutrition have been summarised in a short addendum to the text.

Such a wealth of useful and accurate information has been included in this book that the reader can criticise it only where his opinions differ from those of the author. This will undoubtedly occur sometimes, for pigkeeping is not an exact science.

Three of the few omissions of detail in the book are the value of sodium fluoride as an anthelmintic, the use of dry vitamin A and D supplements as an alternative to cod liver oil, and the possibility that there is not quite enough riboflavin in many farm-mixed rations. Some pig farmers might like more information on castration within a few weeks of birth, a practice which is becoming increasingly popular, and many will consider that Mr. Davidson's brief mention of fattening houses with indoor pens and outside runs of the types developed in Ireland and at the Harper Adams Agricultural College is inadequate.

The addendum deals with the animal-protein factor and antibiotics. Mr. Davidson has wisely added a note of caution on the use of antibiotics, for their mode of operation as growth stimulants is not fully understood and we have yet to learn more of their usefulness under the diverse conditions encountered in British agriculture.

I. A. M. Lucas.

4019

REGISTRAR-GENERAL. **Ninety-eighth annual report of the Registrar-General for Scotland 1952.** H.M.S.O., Edinburgh, 1954, pp. 408. Price 10s. 6d. net.

4020

REGISTRAR-GENERAL. **Statistical review of England and Wales for the year 1952. 1. Medical.** H.M.S.O., London, 1953, pp. x + 368. Price 10s. net.

4021

REGISTRAR-GENERAL. **Statistical review of England and Wales for the five years 1946-1950. Text, civil.** H.M.S.O., London, 1954, pp. vii + 243. Price 6s. 6d. net.

4022

REGISTRAR-GENERAL. **Statistical review of England and Wales for the year 1949. Supplement on general morbidity, cancer and mental health.** H.M.S.O., London, 1953, pp. ix + 186. Price 7s. 6d. net.

8. FOOD AND AGRICULTURE ORGANIZATION (AND OTHER ORGANIZATIONS) OF THE UNITED NATIONS

Monthly Bulletin of Agricultural Economics and Statistics. Vol. 3, No. 3, March, 1954, pp. 60. Economic appraisal of technical assistance projects. No. 4, April 1954, pp. 56. Notes on statistical methods for African agriculture. No. 5, May 1954, pp. 58. Disposal of agricultural surpluses.

Development Paper No. 42. Co-operative hybrid maize tests in European and Mediterranean countries—1952. Rome, Italy, March 1954, pp. v + 179. Price \$2.00. (Cf. Title, p. 251, Vol. 24.)

Development Paper No. 43. Water laws in Moslem countries. Rome, Italy, March 1954, pp. iv + 202. Price \$2.00.

Nutritional Studies No. 11. Food composition tables—minerals and vitamins. Rome, Italy, March 1954, pp. v + 117. Price \$1.00.

These tables are in amplification of those on proximate constituents published in 1949 (see p. 502, Vol. 19). They include data on calcium and iron and on vitamin A and B₁, riboflavin, nicotinic acid and ascorbic acid and an

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extensive bibliography with 539 references is appended. In her introductory notes the compiler, Miss C. Chatfield, says that geographical differences as between countries may, in the past, have been overemphasised and that differences caused by variations in season, variety, condition of samples and laboratory practices may be of greater significance. The need for further information where it exists is indicated.

Nutritional Studies No. 12. Rice enrichment in the Philippines. Rome, Italy, March 1954, pp. v + 109. Price \$1.00.

The results obtained during the experimental period of the Rice Enrichment Programme in the Philippines have been described in earlier reports (see Absts. 4905, Vol. 18; 5395, Vol. 19; 2621 and 5683, Vol. 20 and 928, Vol. 21). Early in 1951 enriched rice was introduced commercially throughout Bataan Province and when, in the next year, its issue was extended to Tarlac Province the total population affected was over 400,000. In 1952 a team of experts visited the area and in addition to making a rapid dietary and clinical survey have now reported on the working of the scheme.

Their report is in two main sections which describe rice enrichment in its nutritional and its commercial and administrative aspects. The 17 appendixes include tables which refer to such subjects as relevant work from the earlier surveys, the results of this later one, mortality rates from beriberi and the composition and cost of manufacture of the premix used for enriching rice.

After it had been prepared the report was read by Dr. Juan Salcedo (Jr.) who had been closely connected with the development of the scheme and his views and comments made in his official capacity as Secretary for Health to the Republic are included together with a copy of the Act which regulates the sale of rice.

The problems encountered in the education of a population in the use of enriched rice and in the importation of the chemicals, their addition during milling and its administrative control are considered in full. The experience obtained by the Government of the Philippines in this pioneering work will be of value to other governments contemplating similar action.

Growing food for a growing world. The work of FAO 1952/53. Rome, Italy, February 1954. Price \$0.50.

This report is for the year which ends the first decade since the Hot Springs Conference was held. The need for greater food production is emphasised by the Director-General in his foreword for, although a remarkable increase has taken place during that period, it has occurred in the more developed countries and among the people who are, in the main, already well fed; among the less

fortunate of the world's inhabitants there have been increases in their numbers and in their awareness of their disadvantages. The report provides only a brief summary of the work of the agency. Its efforts are described which aim to extend the world's farm lands, to obtain greater yields from them and to increase their stock-carrying capacities, to improve livestock of all kinds and fishery resources by breeding, better husbandry and the eradication of disease and, towards the end of the scale, to improve methods of marketing the products. Finally the difficult task of educating the populations in making the best use of the foods which reach them is also being tackled. The numerous illustrations give good indication of the variety of the agency's work.

Report of the 7th Session of the Conference, 23 November-11 December 1953. Rome, Italy, March 1954, pp. xiv + 256.

The conference adopted 77 resolutions. Food production in countries excluding USSR, Eastern Europe and China was about 23 per cent. larger than before the war and had, for the first time, caught up with the growth of population. But it was very uneven and 17 of the resolutions were concerned with the trends and policies in respect of food and agriculture. The Organization's work on nutrition came under review and a resolution referring particularly to protein deficiency of mothers and children and recommending the intensification of the work and its co-ordination with that of WHO and UNICEF was approved.

9. DEPARTMENTAL AND OTHER REPORTS

UNITED KINGDOM.

Milk Marketing Board, Thames Ditton, Surrey.
Report for the Year ended September 1953. Pp. 199.

National Institute for Research in Dairying, University of Reading. Report for the Year 1953. Pp. 138.

Antibiotics for pigs.
Antibiotics, thyroxine and stilboestrol in combination for pigs.
Indoor and outdoor rearing of pigs.
Copper for suckling and fattening pigs.
Sow's milk: production, nutritional properties and factors involved in ejection from mammary gland.
Sow's milk substitutes and artificial rearing of pigs.
Methods of supplying vitamins A and D to pigs.
Bacterial flora of the pig's digestive tract.
Mortality, birthweight and growth rate of pigs.
Evaluation of grassland for milk production.
Losses incurred by wilting grass.
Digestibility of grass and alfalfa silage.
Digestibility of a roughage fed in association with a carbohydrate concentrate (steers).
Factors affecting efficiency of food utilisation by ruminants: effect of lactation; effect of different concentrates on cellulose breakdown in reticulo-rumen; influence of roughage level on fat content of milk; relative value for milk production of National Cattle Foods Nos. 1 and 6.
Nutritional significance of colostrum.

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Use of grass in the nutrition of the young calf.
Stimulation of milk production in the cow by thyroid-active substances.
Oestrogens in plants.
Hypomagnesaemia and grass tetany: relation to sulphate of ammonia fertiliser.
Effect of adrenocorticotrophic hormone on composition of milk.
Protein studies with rats: addition of lysine to stored (deteriorated) dried skimmed milk: effect of level of protein intake and age of rat; role of vitamin B₁₂ in the utilisation of protein; evaluation of nutritive value of protein by analysis of rat livers.
Nutritional role of the micro-organisms of the alimentary tract; vitamin synthesis in the ruminant; metabolism of vitamin B₁₂.
Vitamin A studies: conversion of carotene to vitamin A in the intestine and other sites; preformed vitamin A and provitamin A pigments in marine invertebrates; carotenoids in chick nutrition.
Development and application of methods for the measurement of vitamins: nature of animal-protein factor; chick and rat tests with "intrinsic factor"; microbiological assay of vitamin B₁; vitamin B₁₂-binding factor in sow's milk.
Antibiotics and infection in chickens.
Use of radio-active calcium in metabolic studies.
Vitamin D content of pastures.
Destruction of riboflavin in milk by light.
Effect of adrenocorticotrophic hormone on the concentration of some B-complex vitamins in cow's milk.

EAST AFRICA.

East African Agriculture and Forestry Research Organisation, Kenya. Annual Report for the Year 1953. Pp. 95.

Digestibility of oat silage.

Variation in digestibility of feed by native and exotic sheep. *No variation found.*

Effect of adding protein, urea, starch and sugar to a ration of hay.

Techniques for measuring grassland productivity.

Techniques for recording liveweight.

Factors affecting accuracy of feeding trials.

NEW ZEALAND.

The Dairy Research Institute (N.Z.), Palmerston North. Twenty-fifth Annual Report for the Year 1952-53. Pp. 28.

Effect of low plane of nutrition during the dry period and for a short period after calving on yield and composition of milk throughout whole lactation.

Efficiency of twins as experimental animals.

Composition of night and morning milk.

Variation in milk composition due to age of cow.

Relationship between fat, lactose and protein in milk.

UNITED STATES OF AMERICA.

Agricultural Experiment Station, Alabama Polytechnic Institute, Auburn. 62nd and 63rd Annual Reports for January 1, 1951—December 31, 1952. Pp. 62.

Comparison of winter pasture, molasses-sprayed groundnut hay and maize silage for milk production.

Value of grain for dairy heifers under Alabama conditions.

Individual outside pens versus barn pens for dairy calves.

Factors affecting nutritive value of *Lespedeza sericea* for dairy animals.

Pennsylvania State College School of Agriculture. 66th Annual Report of the Pennsylvania Agricultural Experiment Station. Bull. No. 569, July 1953, pp. 20.

Factors influencing the nutritive value of foods. Factors affecting the vitamin content of canned foods.

Physical and chemical properties of fats in relation to their composition, structure and utilisation.

Evaluation of grasses and legumes for hay, grass silage, and pasture for dairy cattle.

Evaluation of grasses and legumes for use as poultry pasture.

The effect of supplementing practical dairy rations with vitamin A concentrates on milk and milk fat production and on various physiological processes related to milk production.

Interrelations between nutrition, microbial flora of the rumen and "X" disease (hyperkeratosis) in cattle.

Characteristic dynamic effects of diets, foods, and food constituents.

Measurement of the nutritive values of pastures and of pasture plants.

Effects of variations in nutrient composition of diets on growth and longevity in rats.

The efficiency of utilisation of normal diets of equal metabolisable energy but differing in protein, carbohydrate, or fat content.

United States Department of Agriculture. Report on the Agricultural Experiment Stations 1953. Pp. 177.

GERMANY.

Deutsche Forschungsanstalt für Lebensmittelchemie in München. 16. Bericht, April 1951 to March 1953. Pp. 35.

Protein breakdown in wheat and ryemeal as well as in dough and bread by the use of buffer solutions.

Characterisation of milk proteins by electrophoresis.

Estimation of small amounts of phosphatides in fats.

Colorimetric estimation of keto-hexoses.

Colour development in cooked potatoes.

Fluorine content and fluorine compounds in food with special reference to water.

Vitamin fortification of foods.

Oxidative break-down of vitamins A and C.

Chemical estimation of vitamin A in margarine.

Artificial colouring of foods.

JAPAN.

Annual Report of the National Institute of Nutrition, Tokyo, 1953. Pp. 77.

Basal metabolism of Japanese. Recovery post-war.

Specific dynamic action in man: effect of energy intake; effect of muscular work.

Relation between basal metabolism and nutrient intake of prisoners.

Effect of climate on basal metabolism.

Effect of magnesium on the utilisation of dietary calcium: high-magnesium, high-phosphorus, and moderate and low-calcium diets.

Calcium balance study on adults.

Calcium fortification of boiled rice and its vitamin B₁ content.

Effect of enriched rice on urinary excretion of vitamin B₁ and vitamin B₁ in blood of children.

Use of different calcium salts in bread enrichment.

Availability of calcium: seasonal influence of oxalic acid and effect of protein on its influence.

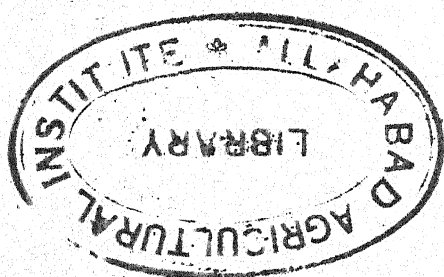
Effect of calcium oxalate and oxalic acid on the human body.

Effect of vitamin B₁₂ and antibiotics on utilisation of protein and calcium.

Antirachitic effect of bicholestatriene.

Diet study of urban workers and of low-income families.

Comparison of analysed and calculated values for nutrients in dietary surveys.



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LAND USE AND DEVELOPMENT IN AUSTRALIA

BY

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INTRODUCTION

AUSTRALIA is the smallest and least populous of the continents, there being but 9 million people in its 3 million square miles. The United States, with the same area, had a population of 150 million in 1950. Australia has also had much the shortest agricultural history, for the scanty aboriginal population was entirely nomadic, without any agricultural or pastoral industries whatsoever. The commencement of white settlement in 1788, predominantly as a penal settlement, proved somewhat unfavourable for the encouragement of systematic primary production. With the exception of a few significant events, such as the early introduction of the merino sheep and the colonisation of South Australia by free settlers under the Wakefield Scheme, which began in 1836, there was little evidence until transportation of convicts ceased in the middle of the century that considered policies of settlement and land development were being followed.

Hence it is true to say that what has been achieved in Australia is the work of only one century. When the shortness of the time, the unfamiliar and discouraging climatic conditions, the poor soils and the limited water resources of the continent are taken into account, it is indeed surprising that so many Australian people not only support themselves on a high standard of living,

but also contribute materially to the food and clothing supplies of many other lands. Further, the adaptation by trial and error of European agriculture and stock husbandry to Australian conditions in the early years, and the scientific elaboration of farming practices in the last thirty years or so, have proved of widespread interest to agricultural scientists in other regions. It now remains to be seen how far present-day progress can be pushed before forbidding natural conditions prove too difficult for the methods of scientific and economic agriculture.

SUMMARY OF PRODUCTION STATISTICS

Primary production in Australia is characterised by a high degree of mechanisation and large-scale operations. As a result the number of people associated with farming and pastoral pursuits is only 3 million.* The remainder of the population is occupied in secondary and tertiary industries predominantly associated with large cities on the seaboard: the populations of Sydney and Melbourne alone total 3 million people.

The following details epitomise primary production in Australia today and indicate the relative

* Yet this proportion is well above that in the United States, which is approximately one-fifth.

importance of internal and export markets for the goods produced. There are about 115 million sheep, which produce 300,000 tons of meat and 1100 million pounds of wool per annum. Only a small part of the meat is exported, but most of the wool goes overseas. A beef cattle population of almost 10 million produces 700,000 tons of meat annually, of which about one-fourth is exported. There are about 3 million dairy cows in Australia, yielding 1200 million gallons of milk annually. Some of the milk goes to manufacture 165,000 tons of butter and 45,000 tons of cheese, and about half of each is exported. Over 100,000 tons of eggs are produced yearly and one-quarter is exported.

Australia produces 150 to 200 million bushels of wheat per annum from 11 to 14 million acres of crop: about half is exported. Oats, maize, barley, rice, sorghum and peas also are grown, and a proportion of them is exported. Almost one million tons of sugar are produced each year from about 400,000 acres on the eastern tropical and sub-tropical coast. About one-half is exported as sugar and in processed goods. Numerous varieties of both temperate and tropical fruits are produced, in most instances for local consumption, but there is an important export trade in apples and pears, citrus fruits, dried vine fruits and wine, and fruit products such as jam and canned fruit. Production of potatoes and other vegetables is organised to supply the home market, but a small amount of both canned and fresh vegetables is exported.

The agricultural and pastoral production just summarised depends partly on the annual use of 1.5 million tons of artificial fertilisers, chiefly super-phosphate, which are applied to 28 million acres of land, of which half is pasture.

Timber is produced from Australian forests, both natural and planted, to the extent of 1200 million super-feet per annum, of which about 50 million super-feet are exported, but the amount exported is more than counterbalanced by an importation of 250 million super-feet.

PRODUCTION REGIONS

The map shows the broad primary production regions of Australia, in which agricultural, pastoral and forestry practices are dependent on different combinations of types of soil, climate and topography. Each region is discussed here in turn, with reference to established utilisation and to developmental or conservation trends. These regions are naturally somewhat arbitrarily delineated, but so long as some allowance is made for the overlap of primary industries from one region to another they provide a convenient and realistic basis for a discussion of Australian rural activities.

A. SOUTHERN MOUNTAIN REGIONS

There are two of these regions, one in Tasmania and the other on the mainland. The latter embraces the Australian Alps in southern New South Wales and eastern Victoria, and the former the mountainous tracts of the western and southern parts of Tasmania. Elevation ranges from about 2500 to 7000 feet on the mainland and from sea level up to 5000 feet in Tasmania.

The climate is alpine, with from 30 to over 100 inches of precipitation per annum, part of it snow.

The soils consist of high moor peats, alpine humus soils, skeletal soils and bare rock, with podzolic soils in the lower mountain valleys and passes, and peaty podzols on the inter-mountain plains of the region in Tasmania.

The southern mountain regions are used for the sparse summer grazing of sheep and cattle on the rough natural pastures of the highlands. Pasture is being developed as in the temperate regions (B) in the lower valleys and passes, and there is considerable production of timber from natural forests on the lower and intermediate slopes of the mountains.

Above the lower lands very little development appears possible: conservation of soil, vegetation and water resources is of primary concern. All forms of land-use must be subordinated to the conservation of water because hydro-electric schemes are using steadily more, and on the mainland it is required for the irrigated areas in the sub-humid and semi-arid regions (D and E) in south-eastern Australia.

Attempts have been made on an experimental scale to produce sown pastures on the lower lying peaty podzols in Tasmania, but so far the acidity, with pH values down to 3.5, extremely high lime requirement, low fertility and waterlogged nature of these soils have prevented any success of economic significance.

B. TEMPERATE REGIONS

There are four temperate agricultural regions in Australia. The largest, in the south-east of the continent, covers the lower south-east of South Australia, southern and central Victoria, coastal and sub-coastal New South Wales, and a small portion of southern Queensland. The next largest comprises the south-western corner of Western Australia. There is one broken region with the Mount Lofty Ranges, Kangaroo Island and southern Eyre Peninsula in South Australia, and the fourth covers northern and eastern Tasmania and the islands in Bass Strait.

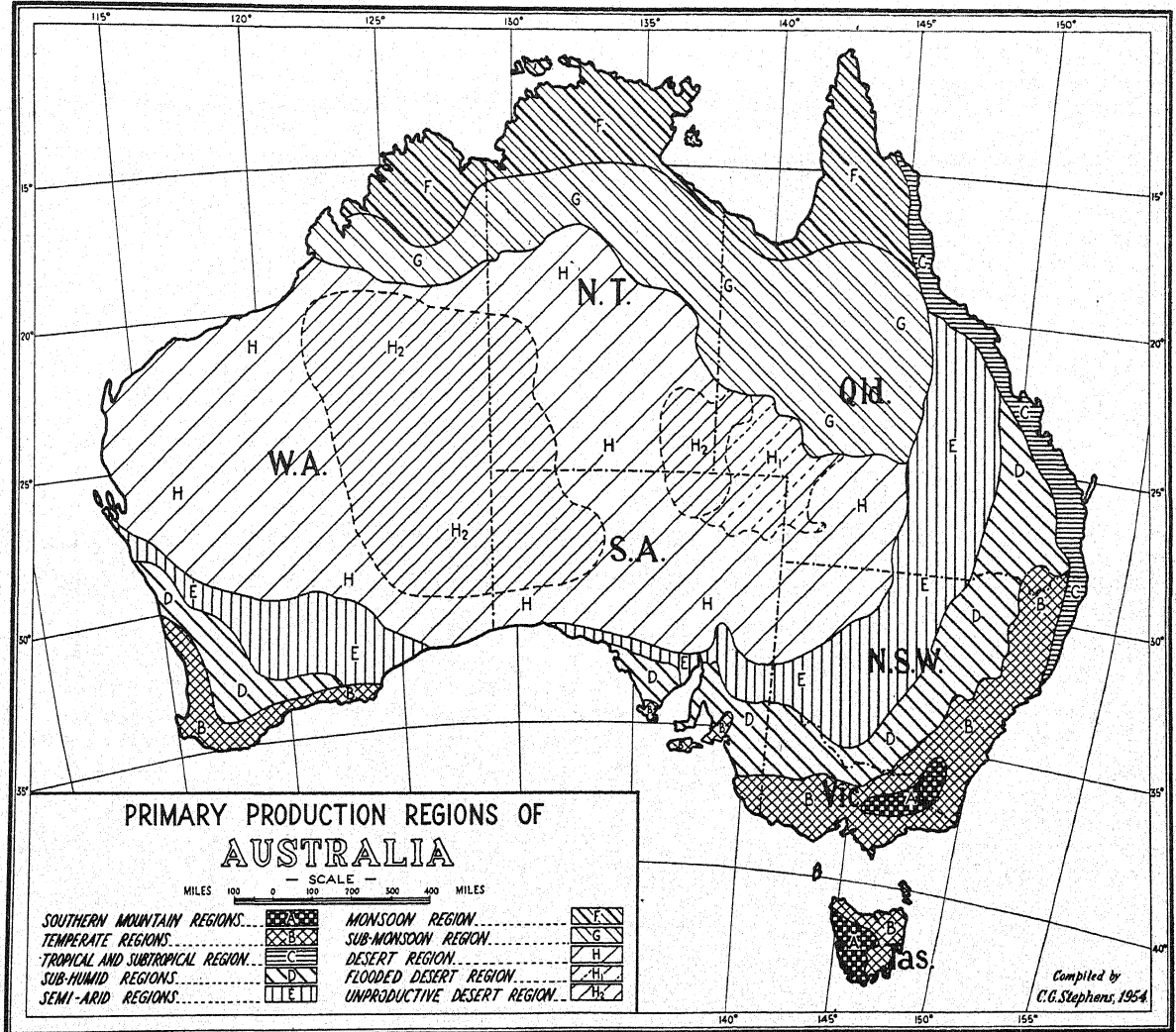
The climate in the temperate regions ranges from mild to warm temperate, annual rainfall being from about 20 to 60 inches, most of it in winter, except in the area in coastal and northern

New South Wales and southern Queensland, where it is more uniformly distributed, with perhaps a slight excess in the summer months.

The soils of the temperate regions consist of a variety of podzolic and solodic soils; lateritic podzolic soils are dominant in the Western Australian region. Skeletal soils are abundant in hilly and mountainous areas and considerably restrict the potentiality of the Tasmanian and

on the podzolic soils. Timber is produced from both native and planted forests, the former dominated by species of *Eucalyptus* and the latter composed principally of *Pinus* spp., of which *P. radiata* is the most extensively planted and productive. There is a trend towards the utilisation of the native forests on a sustained yield basis.

The obvious direction for development is in the further expansion of sown pastures, which has



south-eastern regions. There are small but very important areas of krasnozems, brown earths, rendzinas and alluvial soils.

The predominant land-use characteristic of the temperate regions is stock farming with sheep, and dairy and beef cattle on both native and sown pastures. Farming is mixed on the more fertile soils such as the krasnozems, rendzinas and alluvial soils, and fruit is grown in favourable situations

already been most prominent in agricultural activities in temperate regions for the last thirty years. It dates from the accidental introduction of subterranean clover and the use of superphosphate to top-dress pastures which had subterranean clover or some other legume such as white clover as an important constituent. No particular difficulty has been encountered on the podzolic soils, but on the solodic soils, the lateritic podzolic soils and the podzols

proper, sown pasture was not generally established until deficiencies of trace elements were recognised and corrected. Copper, molybdenum and zinc were involved singly or in combination. Copper, zinc and manganese have proved of importance also for pastures and crops on some of the more fertile soils, such as the rendzinas and black earths in both the temperate and the sub-humid region, and copper and cobalt singly or together have proved to be necessary for the health of stock in some parts of these regions. The early control of coast disease in stock by the use of cobalt and copper has led by the use of one or both of them to control of other defects, such as steely wool, and of a number of animal health disorders of local and scattered distribution, for example, Gould's Country disease in north-eastern Tasmania, and staggers in stock grazing on phalaris-dominant pastures.

The rise in fertility of the soil under top-dressed, sown pastures on the leached soils may well lead ultimately to an expansion of arable farming on to some of these originally poor soils. To meet the needs of soil conservation, arable farming must be restricted to areas of suitable topography, and wide rotations must be used, for these soils will readily lose the structure and fertility acquired under pasture. Of recent years there has been a considerable expansion of potato growing from the long-used krasnozems and swamps on to such soils where they have been many years under pasture, the potato crop frequently being irrigated from small catchment areas on the farm or from locally pumped underground water. In the drier parts of the region winter-sown cereals could similarly make use of the accumulated fertility.

C. TROPICAL AND SUB-TROPICAL REGION

The north coast of New South Wales and almost the whole of the eastward-facing coast of Queensland constitutes the tropical and sub-tropical region. It is a very long narrow area up to fifty miles wide lying between the Dividing Range and the coast.

The climate is tropical in the northern half of the region and sub-tropical in the remainder. Rainfall varies from 30 to over 100 inches per annum, with a conspicuous alternation of relatively dry and wet zones along the length of the region. The areas of higher rainfall arise partly from the juxtaposition of the higher mountain masses and the coastline. There is a notable maximum rainfall in the summer months, and in the drier belts the winter rainfall is so low that irrigation of the sugar cane crop by pumping river or underground water is often standard practice. One such irrigated area on the delta of the Burdekin River has the highest yield of sugar cane per acre in Australia.

The soils of the region are predominantly podzolic but there are more important though smaller areas of krasnozem and alluvial soils and, near Brisbane, lateritic red earths. Solodic soils also are extensive near the coast, where with ground-water podzols and swamps they make up large tracts of relatively open but little used heathland loosely referred to as "wallum" country.

Sugar production stretches throughout the length of the region, but is less intensive in the south. Dairying is much more developed to the south and falls away rapidly even south of the tropic of Capricorn; it is particularly intensive in north coastal New South Wales. Beef cattle are relatively prominent throughout the region. A high proportion, of which many are brought into the area as store stock, are fattened in the area before going to meat works. The beef cattle graze over all types of country, but both dairying and sugar cane production are found chiefly on the better soils such as krasnozems and alluvial soils, with some on podzolic soils.

Production of tropical fruit is extensive in the region, and supplies most Australian requirements. Banana and pineapple cultivation are the most important industries, and are well organised. A significant proportion of the pineapples is canned.

Timber is produced on a moderately large scale in areas of rain forest. Cabinet-making woods and plywood production are important.

The outstanding problem of the tropical and sub-tropical region is the development of sown pastures corresponding in productivity with those of southern Australia where subterranean clover has proved to be a suitable pasture legume. A corresponding clover is needed in the tropics, especially in the more northerly areas and on the poorer podzolic and solodic soils. In the southern portion of the region, white clover occurs in *paspalum* and *kikuyu* pastures on the more fertile soils on which the dairying industry is concentrated. A good deal of effort has so far been devoted to seeking the right plant, with trials more particularly of such wellknown tropical pasture legumes as *Stylosanthes* and *Centrosema*, but so far with only partial success. The full solution will not only extend the dairy potential of the region, but also greatly increase meat production, since at present grazing by beef cattle is confined almost entirely to natural pastures.

Cultivation of sugar cane and tropical fruit has brought soil conservation problems in its train. A great portion of the sugar cane and some tropical fruit, especially bananas, are grown on moderately to strongly sloping land. Although many of the soils in these situations are highly permeable, they are not sufficiently well structured to resist the impact of heavy tropical rain. Consequently sheet and gully erosion are common, and can occur

in certain circumstances even while the land is under a heavy crop of cane. There are a number of contributing circumstances, the most notable of which are the common practice of running cane rows up and down the slope, lack of trash conservation, and restriction of the cane crop, under the assignment system used to control the industry, to specific tracts of land. The last procedure tends to prevent the development of suitable rotations and the adequate use of green manure crops, with consequent damage to soil structure and reduction of permeability. So far no widely used system of soil conservation has been evolved, but such a system will become increasingly imperative as losses of soil and reduced fertility cause yields to decline and so neutralise the splendid efforts of the plant breeders who have produced remarkably high yielding varieties of cane during the last three decades. The situation will ultimately correspond very closely with that in the wheat-producing areas in the sub-humid regions (D) unless appropriate techniques are found for soil conservation. In other parts of the region there is intermittent erosion of alluvial soils by flooding, which causes river banks to collapse and fields to be stripped of their cultivated layer.

D. SUB-HUMID REGIONS

There are two sub-humid regions; the smaller is the agricultural belt of Western Australia and the larger the area extending from Eyre Peninsula in South Australia through north-western Victoria and the western slopes of New South Wales to the southern subcoastal area of Queensland.

The climate is characterised by a clear periodicity of the rainfall, which varies from 12 to 30 inches per annum. In the south and west there is a Mediterranean type of climate with winter rain and summer drought. In northern New South Wales and southern Queensland most of the rain falls in summer, but there are also useful winter rains.

The soils of the eastern region comprise broad sweeps of red-brown earths, black earths, solonised brown soils, grey and brown soils of heavy texture and solonchic soils. The black earths are predominant in Queensland and northern New South Wales. The region in Western Australia is composed of a complex of unidentified brown soils with solonchic and relic lateritic podzolic soils. Skeletal soils are common in parts of the sub-humid regions but nowhere cover large tracts of land.

The sub-humid regions form the wheat and sheep belt of Australia. Arable farming is predominant, and is devoted largely to wheat-growing, mostly on short rotations. Other cereals such as barley and oats are important also, and in the summer-rain areas grain sorghum and maize are common crops, although the last is grown to a larger extent

in the tropical and sub-tropical region. Sheep are grazed on both natural pastures dominated by *Danthonia* and stubbles and volunteer pastures in the wheat-growing rotation; in addition some relatively small areas of lucerne, where conditions for its growth are suitable, are used for sheep grazing, but more important are the sown pastures in the moister parts of the regions. The sown pastures, being based on short-season strains of subterranean clover such as *Bacchus Marsh* and *Dwalganup*, represent a spill-over from the temperate regions, but such pastures are not possible all through the sub-humid regions and in the middle and drier parts a volunteer growth of medicks is the most important legume.

In New South Wales, Victoria and South Australia the sub-humid region, with the adjacent part of the semi-arid region (E) in New South Wales, is the site of the main irrigation works of Australia. It is mostly red-brown earth and solonised brown soils that are irrigated, but there are significant areas of grey and brown soils of heavy texture and lesser areas of swamp soils also irrigated, the former of particular importance in the production of rice. Citrus, vine and stone fruits, and pastures are the principal irrigated crops. The fruit industries, which include dried fruit production on a large scale, are concentrated on irrigated, solonised brown soils and red-brown earths. Irrigated pastures are grazed by both sheep and dairy cattle.

Associated with the industries just described there are a number of problems and developmental possibilities, of which the erosion problem of the wheat lands is probably the most urgent and important. By statistical analysis of the records of wheat yields in the several districts in South Australia, Cornish (1949) has been able to show that after an early initial rise associated with land development, wheat yields are now declining or beginning to decline, or are stabilised over the greater part of the wheat belt in the State, continuing to rise in only a small part of the area. The fall in wheat yields is associated with declining soil fertility due to soil erosion, deterioration of soil structure and loss of organic matter. The writer and his colleagues (Stephens *et al.*, 1945), by the study of a selected area during an extensive soil survey, were able to show that the soil deterioration is associated with a combination of poor management practices, namely, short rotations, frequently two-course, fallow-wheat, and overgrazing by sheep. It is considered that the conditions revealed by these investigations apply in some degree throughout the wheat-growing areas of Australia and that they have largely negated the beneficial effects of the wheat-breeding programmes and the fertility and rotation investigations of the several scientific institutes.

Fortunately a vigorous programme of soil conservation research and extension is now under way throughout most of Australia, but it must be realised that some of the damage is permanent, especially in the areas severely affected by wind erosion and by deep gullying. In Western Australia the problem is complicated by the development of salinity in some of the soils.

At the present time there are about one and a half million acres of irrigated land in Australia. Probably twice that area, perhaps three times, might be irrigated, but beyond that there seems little prospect of further development, because of the limited water supplies. It therefore becomes important to make the best use of the available water; that is, to use it on the most responsive soils, for the most valuable crops, and to minimise loss of water through evaporation and seepage by conveying the water over the shortest possible distances. The sub-humid region of south-eastern Australia offers the best possibilities. There are limited prospects in the temperate regions (B), more particularly in Western Australia, where, however, salinity may cause difficulty in some parts in the future. In eastern Australia some irrigation in the semi-arid region (E) has already been attempted, but an increasing proportion of heavy-textured and slowly permeable soils has already brought significant problems to light. The possibilities of irrigation in north and central Queensland may have to be assessed and tested in terms of such soil conditions, for suitable lighter-textured soils are not common there except as narrow ribbons of levee bank formations.

Pasture development in the sub-humid regions outside, as well as in, the irrigation areas is of particular importance and interest. As was mentioned above, the wheat lands are characterised, between crops, by volunteer pastures in which the medicks play a major role. Some progress has been made in selecting suitable strains, particularly of barrel clover (*Medicago tribuloides*) in which the spines of the seed pod are suppressed, and in demonstrating the value of sowing pastures with this legume as a component, although it is not adapted to all soils and climates within the sub-humid regions. There is a conspicuous need for suitable grasses; in the south annual Wimmera ryegrass under careful management can do much to meet the need.

On the solodic soils of the moister areas a recent success of notable importance is the demonstration by Riceman (1948) that pastures based on the short-season strain of subterranean clover, Bacchus Marsh, can be established provided the minute requirements for the trace elements, zinc and copper, are met and adequate phosphate is supplied. This investigation has led to what is almost a boom in pasture establishment on these

and other equally poor soils by both official and private organisations and by individual landholders.

Another interesting and well organised development in recent years has been the production of groundnuts in the sub-humid region in Queensland, notably around Kingaroy. About 10,000 tons of nuts are now produced annually from 20,000 acres of land.

E. SEMI-ARID REGIONS

The semi-arid regions include two units, the larger, in eastern Australia, covering a portion of South Australia, the central west of New South Wales and the east central part of Queensland. The smaller unit is a belt of variable width in Western Australia stretching from the Great Australian Bight to the west coast.

The climate is semi-arid with an annual rainfall varying in the southern areas from 8 to 15 inches and in Queensland up to 25 inches, the larger figure applying only to the northern extremity of the region, which comes within the range of both the summer monsoonal and the tropical coastal weather system. In the southern areas most of the rain falls in the winter.

There are solonised brown soils, brown soils of light texture, grey and brown soils of heavy texture, and desert loams, with some considerable areas of black earths entering the northern part of the eastern region in Queensland. In some localities there is a relative abundance of skeletal soils.

Predominantly the semi-arid regions are devoted to sheep grazing, but beef cattle are important in the eastern unit and increase in numbers in the Queensland portion. Almost all grazing is on natural pastures, some of which have the character of shrub steppe. *Danthonia* is the important grass in the south and Mitchell grass (*Astrebla* spp.) and other tall species in Queensland.

In the semi-arid part of southern New South Wales there is some irrigation, the principal intention being to provide irrigated pastures capable of producing fodder for conservation and thus exerting some stabilising influence against the depleting effects of periodic droughts on the sheep industry. But, under the difficult conditions of this area, with its fine-textured and slowly permeable soils, the development of irrigated, sown pasture has been beset with difficulties, and as yet is little more than a subject for research and experiment.

Two serious and unfortunate problems are common to the semi-arid regions. The first, closely associated with the grazing industry, particularly in the southern areas, is the prevalence of sheet and "scald" erosion, the latter due to both wind and water scouring. Initially both these forms of erosion are caused by overgrazing, which lays bare

the soil to the forces of wind and water on flat as well as sloping sites. "Scald" erosion occurs mostly on flat or gently sloping land where the eroded surface develops a type of sealing which is particularly unfavourable for seed germination and plant establishment, and is often accompanied by increased soil salinity, an added deterrent to plant re-establishment.

The second problem appeared when attempts were made to extend arable agriculture to the semi-arid regions without benefit of irrigation. In the southern areas such attempts were associated with former campaigns for increased wheat production. Because of the unreliable and insufficient rainfall, and despite the breeding of hardier types of wheat, attempts to grow grain in this area were finally abandoned. The short and unreliable rainfall season provided too little moisture for economic crops and, after some aggregation of farms, most of the land has gone back to sheep grazing.

Recently in the extreme northern part of the region in Queensland a very large and well organised attempt has been made to grow grain sorghum on the heavy black soils for pig raising and cattle fattening. So far, yields have been so low, because of unfavourable moisture conditions and insect attack, that the venture has failed to achieve its stated objects. It has had to be greatly curtailed and its future is in doubt.

F. MONSOON REGION

The monsoon region embraces the coastal and in part the sub-coastal lands of northern Australia. It extends from the Kimberley area in the extreme north of Western Australia through the upper portion of the Northern Territory to Cape York Peninsula in Queensland.

The average rainfall of the region varies from 25 to 60 inches per annum and decreases steadily inland. It is monsoonal in character and limited to the summer months, December to March. The monsoon is unreliable and the rainfall is therefore very variable. Summer droughts are relatively common and, as happened recently, sometimes occur in two successive seasons. The other months of the year are almost rainless and temperature remains relatively high, with the result that quite regularly drought persists for about eight months of the year.

The soils consist of lateritic red earths on extensive remnants of old land surfaces, podzolic soils, and smaller areas of alluvial and grey and brown soils of heavy texture. Adjacent to the coast there are large areas of marshy and mangrove country periodically inundated by the sea. Skeletal soils and exposed bare rock are common, particularly in the Kimberley area and in Arnhem Land in the Northern Territory.

The sole major primary industry of the region is

beef cattle grazing. The pasturage is almost entirely of the tall grasses of a tropical savannah woodland, with some open plains. The grass grows rapidly during the monsoon and then dries off to remain as dry feed until the following wet season. Cattle fatten readily while the grass is green, but steadily lose condition in the ensuing dry season, because of the declining quality of the pasture.

As in the adjoining sub-monsoon region (G), stock move from the area generally after they are at least three years old. Some in north-west Australia go direct to the meat works at Wyndham, some are shipped out, some travel by road transport to railheads, but most are driven for long distances over the stock routes before being disposed of. A small fraction are now slaughtered on the north-western cattle stations and the dressed carcasses are flown direct to the freezing works at Wyndham.

Numerous organised attempts have been made to establish a significant area of ploughed land in the Darwin-Katherine area in the monsoon region, but so far they have always failed. At the present time a well organised attempt is being made at and near Katherine towards the southern edge of the region, where a research station has been established by the Commonwealth Scientific and Industrial Research Organization. Here research into both dryland and irrigation farming is going forward. Sorghums, cotton, tobacco, groundnuts, pastures and other crops have been sown in fertiliser, variety and cultivation trials. Results, although not spectacular, have been sufficiently good to encourage a move to apply the more promising methods to tobacco, sorghum, groundnuts and pasture on a demonstration farm. Experimental work with rice on the flood plains of the Adelaide River nearer Darwin is also in progress. Situated on the Ord River just south of Wyndham, the Kimberley Research Station, a joint organisation of the Department of Agriculture of Western Australia and the Commonwealth Scientific and Industrial Research Organization, is primarily concerned with irrigation research on fine-textured soils. Here rice, sugar cane, pastures, and oilseed crops are under investigation. The work has been greatly hampered by the depredations of huge flocks of native birds, which is perhaps a portent of things to come if small isolated areas of crops are developed throughout the region in places where irrigation and other conditions are favourable. The native bird population of the region is without doubt enormous and could well become extremely destructive of local crops designed to increase food supplies.

Near Darwin a small-scale fruit and vegetable industry has grown up. Principally it supplies the local market, but some vegetables such as beans are flown to southern Australia during the winter

months. The gardens depend on ground water for irrigation. Because of the recent great increase in the mining population of the area the fruit and vegetable industry will undoubtedly expand to meet the increased demand. For many years groundnuts have been grown on the light-textured soils of the levee banks of the Katherine River, but not a great deal has been produced, partly because for markets and organisation this crop is so much better placed in Queensland.

G. SUB-MONSOON REGION

The sub-monsoon region extends in a gradually widening and unbroken belt from the Western Australia coastline and the southern Kimberleys through the north central part of the Northern Territory into north-west and central Queensland. The east central portion astride the border of the Northern Territory and Queensland includes the vast open plains of the Barkly Tableland.

The climate of the region, as the name implies, is dry monsoonal. Light rainfall, averaging from 15 to 30 inches per annum and falling almost all in the summer months, and high temperatures characterise the region. The remainder of the year is almost rainless. The rainfall is less reliable than in the monsoon region and may fail almost completely for two seasons in succession.

Here grey and brown soils of heavy texture and brown soils of light texture are predominant; relic lateritic formations and skeletal soils in some areas greatly reduce the value of the country. The heavy-textured soils are the most fertile and usually form open grassy plains; they characterise the Barkly Tableland and the central Queensland area.

As in the monsoon region, beef cattle grazing is the dominant form of land-use, but sheep are grazed at both extremes of the region. They occur in small numbers near the Western Australian coast but in quite large numbers in central Queensland, where they are co-dominant with beef cattle. For the greater part Mitchell and Flinders grasses (*Astrelba* spp. and *Iseilema* spp.), which are of medium height, constitute the bulk of fodder for stock, but shrubs and spinifex play an important part in the areas where sheep are run and on the less fertile soils.

The monsoon and the sub-monsoon region have in common a number of problems connected with the efficient management of the cattle industry. The most pressing of them are inadequate facilities for stock transport and infrequency of water supplies; both appear at the moment to be more important than other problems such as improvement of pastures and breeds of stock. When cattle leave these regions a big percentage of them are driven on the stock routes, frequently for hundreds of miles. They cover about 12 miles a

day and at the end of a long trek they may have lost over 100 pounds weight and deteriorated in quality. The recent use of motor transport on the paved highways between Darwin and Alice Springs and Tennant Creek and Mount Isa to move stock to railheads has done something to improve the situation. It is invariably claimed by the industry that regional beef production could be doubled if the transport problem were solved and more frequent stock-watering facilities provided. With that statement competent observers agree.

Because of the limited distance from water over which stock can graze in long dry periods, the adequate and uniform use of the pasture of the northern areas depends on a sufficiency of water points. In these regions, but particularly in the sub-monsoon region, watering facilities, largely dependent as they are on artesian bores, are not sufficiently numerous to allow uniform pasture utilisation. As a result, in the dry months considerable areas are not grazed at all and pastures near water are overgrazed. The progressive sinking of more bores on stations and stock routes will undoubtedly overcome the problem gradually.

The basic breeds of beef cattle used throughout Australia are British. How far they are truly adaptable to tropical Australia is debatable, but the industry there has been built on them. Some adaptation and selection have been inevitable, and the evidence and opinion of some authorities point to the possibility of complete adaptation in the course of time. Another point of view recognises the need for blood from tropical breeds of cattle and to this end research with Zebu crosses is being pursued by the Commonwealth Scientific and Industrial Research Organization.

In contrast to the sheep-grazed areas of southern Australia a pleasing feature of the monsoon and sub-monsoon regions is their almost complete freedom from signs of man-made erosion. Apart from a few restricted localities such as the Ord River Valley in Western Australia, little serious erosion is evident in northern Australia. Unquestionably this is to a large degree due to grazing by cattle, which are much less destructive than sheep of plant cover because of their top grazing habits.

H. DESERT REGION

The desert region, the largest region of Australia, occupies about two-fifths of the continent and stretches on a wide front from the central areas to the Great Australian Bight in the south and to the coast of Western Australia in the west.

The climate is hot and dry. The annual rainfall averages about 9 inches on the southern edge and 15 inches on the northern margin where it merges into the sub-monsoon region, and falls to about

5 inches in the central areas. It is both unreliable and irregular, and occurs in part in scattered thunderstorms. Consequently there is great variation in precipitation from year to year at any one place. Variation occurs also because the desert, particularly across the centre, is subject to both the southern ocean and the monsoon weather system. In any one year a given locality may get rain from both sources, from only one, or from neither. Hence some years may be almost rainless, which must be kept in mind when stock numbers and their grazing are planned.

The soils of the region are desert loams, relic stony tableland soils, desert sand ridges, shallow red and brown calcareous soils, desert sandplain soils, and some deep red soils of little profile development, as yet unstudied and unnamed. Skeletal soils and bare rock are common in the ranges which traverse the region. Where streams enter the area from adjacent regions their flood plains are characterised by grey and brown soils of heavy texture. The largest significant area where these atypical hydrological and soil conditions prevail is in the north-eastern part of the Lake Eyre basin, and here the so-called channel country makes up a distinctive sub-region shown as H_1 on the map. About one-fifth of the channel country is covered by low-lying, heavy-textured soils which are inundated periodically when normally dry watercourses such as the Diamantina and Cooper's Creek carry flood waters from northern and eastern Queensland. The channel country is potentially the most productive part of the desert region, for each flood is followed by the growth of abundant ephemeral herbage on which stock quickly fatten. Its full utilisation is hampered by the variability in the degree and time of flooding and by lack of transport for the rapid movement of cattle to and from the area as circumstances dictate. Rapid movement of store stock into the area and of fat cattle out of it towards Brisbane or Adelaide is essential to full use of the grazing.

In contrast to the channel country there are two sub-regions, shown as H_2 on the map, which are almost absolute desert of no productivity whatever. The eastern and smaller of the two areas is the Simpson or Arunta Desert, a sea of parallel sand ridges, uninhabited by white man or aboriginal. The second area to the west is a vast tract of sand ridges, stony tablelands and desert mountain ranges embracing the Great Sandy, Gibson and Victoria Deserts; in it there is only a scanty aboriginal population.

For the rest, the desert region provides sparse grazing for sheep and beef cattle; sheep in the west, south and east, cattle throughout, but more particularly to the north and in the central corridor between the two areas of absolute desert. The stock numbers in this large region represent but a

minute fraction of the animal population of Australia and there is little or no apparent prospect of any substantial increase in the numbers. In fact, for the sake of soil conservation, there may be a decrease. Most of the sheep are grazed on perennial shrubs and ephemeral herbage and grasses which appear after rain. The cattle are similarly pastured, but in the north some types of spinifex grass are grazed in addition to the shrubs and ephemerals.

In the northern part of the region the landscape is well preserved; in the south there is notable erosion in some districts, and the perennial bush has been greatly thinned out or killed by too intensive sheep grazing and by the rabbit.

As in the more northerly regions, transport and water supplies are critical problems in some parts of the area. Research into the management of grazing sheep by the Waite Agricultural Research Institute on shrub steppe at Yudnapinna in the region tentatively suggests that an increase in the number of watering points may greatly increase the carrying capacity of the country without detrimental effect, and with a great change in the botanical composition of the pasture. Research on an extended basis to test this finding is now being planned.

There is a great contrast in productivity between the stony tableland soils and the desert loams, the former being very poor. Since the tablelands consistently lie at higher altitudes than the desert loams there may be scope for experiments in diversion of water from them by increasing run-off and then ponding or channelling the additional water on the desert loams where, with more water, experiments in the use of fertilisers with introduced plants such as lucerne might be justified. In this region there is unquestionably an opportunity for bold experimentation with the available water, aimed partly at developing local "fortuitous" irrigation schemes with a minimum expenditure of money and effort on engineering structures.

GENERAL REMARKS

From the regional analysis that has been made it is quite apparent that Australia is essentially a pastoral country through the predominance of animal husbandry and, even more, through the proportion of the continent devoted to grazing. Present development trends are likely to maintain or even increase the devotion to animal industries. From the scientist's point of view the most interesting and certainly attainable improvement to make expansion possible is the increase in artificially fertilised, sown pastures. At present Australia has about 20 million acres of sown pastures, concentrated chiefly in the temperate regions in the south-east and south-west of the continent. Provided certain problems in plant selection and

adaptation can be overcome, establishment of sown pastures may reasonably be expected to spread on a large scale to the sub-humid, tropical and sub-tropical, and monsoon regions. It is estimated that in these and in the temperate regions there are about 100 million acres of land suited in their soil and topography to carrying sown pastures. An example of recent progress (Commonwealth Scientific and Industrial Research Organization, 1953) is the demonstration that *Stylosanthes* may be a suitable pasture plant for the greater part of the monsoon region and for the drier portions of the tropical and sub-tropical regions, where it may ultimately play a part corresponding to that of subterranean clover in the temperate regions.

Arable agriculture in southern and eastern Australia has undoubtedly passed through an era of exploitation, and is now rapidly entering a phase of consolidation and conservation involving some retreat from drier areas and the institution of soil conservation programmes in each of the States and Territories. In northern Australia cultivation of the soil has been spasmodic, fragmentary and of small extent. Currently it is the subject of some research, but its future is as yet uncertain.

At present the greatest activity in land development centres round the settlement of exservicemen from the second world war on farms being made on under- or undeveloped land. On both irrigated and non-irrigated land aggregating some 8.5 million acres, about 6000 new holdings have been created, which have been brought to a preliminary stage of production before occupation. These farms cover all types of production common in Australia but are mostly concentrated in areas of sheep-raising, dairying and mixed farming, with fruit-growing on irrigated land. There is also considerably activity on the part of private enterprise by both individuals and companies. In Australia a widely known instance of private enterprise is the development and subdivision of a vast tract of land by the Australian Mutual Provident Society in the sub-humid region in South Australia, and the settlement on it of individual farmers for sheep raising, a project depending almost entirely on the results of recent research on pasture establishment by Riceman (1948). To date, 60,000 acres have been sown to pasture and another 100,000 acres are in course of preparation. Individual development projects take the form of in-

creased or renewed activity by landholders whose income from primary products, especially wool, have recently been much increased. There has been a wave of prosperity also in the cities. An appreciable proportion of larger city incomes is being devoted, as an investment, to the purchase and improvement of large tracts of land.

The limit to irrigation development in Australia is set not by acres of suitable land but by the amount of available water, which is demonstrably small for a continental mass: for instance, the flow of Australian rivers is but one-twentieth of that of the United States with much the same land area. Because of the general dryness of the climate and the extraordinarily small flow of the streams, there appears to be a total of only about 20 million acre-feet of water available for irrigation after urban and other requirements are met. Half, or nearly half, the amount is already in use, and much of the remainder is committed to projects in some stage of planning or construction.

Pest control in Australia and its effect on the production and preservation of foodstuffs and other primary products has received great assistance from the recent development of insecticides, weedkillers and fungicides. Means for the ultimate control of the plague locust, for example, are now almost in sight. The recent spectacular success with myxomatosis in controlling the rabbit has led to a rapid increase in production, detectable not only in the statistics of the primary industries but also by any competent observer travelling in the country.

It is interesting to speculate how the development of primary production in Australia, as far as it can be foreseen, will influence the population of the continent. Estimates made in terms of current achievements in primary and secondary industrial technology might be significantly altered by possible future developments in such fields as atomic energy or artificial rain-making, but according to a recent statement by Bowen (1954) the prospects do not seem very promising. Unquestionably the more arid half of the country can support no more people. The other half can probably ultimately double or treble its production. This increase, coupled with the standard of living envisaged for the future population, will determine the size of the population. We might reasonably foretell a future population, with the present standard of living, of at least from 20 to 25 million.

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1. TECHNIQUE

CHEMICAL

APPARATUS

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4034

MARTIN, N. H. and FRANGLEN, G. T. The use and limitations of filter-paper electrophoresis. *J. Clin. Pathol.*, 1954, **7**, 87-105. [Dept. Chem. Pathol., St. George's Hosp., London.]

A critical review of available techniques. with about 200 references.—H. G. Bray.

Carbohydrate Constituents

4035

- TULLER, E. F. and KEIDING, N. R. **Determination of protein-bound carbohydrates by the anthrone reaction. Effect of tryptophan.** *Anal. Chem.*, 1954, **26**, 875-878. [George F. Baker Clin. Res. Lab., New England Deaconess Hosp., Boston, Mass.]

The presence of tryptophan introduces an error of 5 to 15 per cent. in the estimation of carbohydrates in terms of the anthrone reaction, owing to the formation of a complex. This error can be corrected for by means of a nomogram prepared by the application of the anthrone reaction to known mixtures of tryptophan and sugars.—H. G. Bray.

4036

- LEMIEUX, R. U. and BAUER, H. F. **Spray reagent for the detection of carbohydrates.** *Anal. Chem.*, 1954, **26**, 920-921. [Nat. Res. Council, Prairie Reg. Lab., Saskatoon, Sask.]

The reagent consists of an aqueous solution of periodate and permanganate at pH 7.2. Any substance which reduces these compounds gives a greenish-yellow spot on a paper chromatogram, the background being permanganate colour.

H. G. Bray.

4037

- HOBBS, M. E. and LAYTON, F. L. **Spectrophotometric modification of the cuprous oxide method for determining sugars.** *Anal. Chem.*, 1954, **26**, 585-586. [Dept. Chem., Duke Univ., Durham, N.C.]

The cuprous oxide precipitated as a result of the reduction of Fehling's solution is isolated, washed and dissolved in 4*N* HNO₃. The Cu present is converted into its ethylenediamine complex, which is estimated spectrophotometrically at 550 mμ.—H. G. Bray.

4038

- MENDEL, B., KEMP, A. and MYERS, D. K. **A colorimetric micro-method for the determination of glucose.** *Biochem. J.*, 1954, **56**, 639-646. [Pharmaco-therap. Lab., Univ. Amsterdam.]

The method is specific for glucose, fructose and complexes containing these sugars and depends on the pink colour produced by glucose heated in 96 per cent. H₂SO₄. It is applicable to blood deproteinised by trichloroacetic acid and silver sulphate.—H. G. Bray.

4039

- KEMP, A. and KITS VAN HEIJNINGEN, A. J. M. **A colorimetric micro-method for the determination of glycogen in tissues.** *Biochem. J.*, 1954, **56**, 646-648. [Pharmaco-therap. Lab., Univ. Amsterdam.]

Glycogen is extracted from tissues by trichloroacetic acid at 100° C. and the method described in the preceding paper is applied directly to the extract. A modification is described by which glucose and glycogen originally present may be estimated separately.—H. G. Bray.

4040

- BOWMAN, W. M. and ENTERLINE, P. E. **Delayed blood sugar determinations. Evaluation of a blood preservative.** *Pub. Health Rep., Washington*, 1954, **69**, 240-246. [Sect. Microbiol., Hyg. Lab. Div., W. Virginia State Dept. Health.]

It is concluded that 10 mg. NaF plus 1 mg. thymol per ml. blood is a satisfactory preservative for sugar for up to 96 hr.—H. G. Bray.

4041

- ASATOOR, A. M. and KING, E. J. **Simplified colorimetric blood sugar method.** *Biochem. J.*, 1954, **56**, xlv. [Postgrad. Med. Sch., London.]

4042

- BOHN, R. T. **Determination of reducing sugars in bread by biological methods.** *Cereal Chem.*, 1954, **31**, 87-99.

D-glucose, D-fructose and maltose are estimated directly on a dough of the bread crumb, using a manometric yeast fermentation method. Lactose may be estimated gravimetrically on the dough after fermentation.—H. G. Bray.

4043

- GRIFFITH, T. and JOHNSON, J. A. **Chromatographic analysis of sugars in bread.** *Cereal Chem.*, 1954, **31**, 130-134. [Dept. Flour and Feed Milling Indust., Kansas Agric. Exp. Stat., Manhattan.]

Sugars are extracted from bread by refluxing it with 80 per cent. ethanol and the extract is examined by paper chromatography using a propanol: ethanol: water mixture (7:1:2) as developing solvent. The changes occurring in sugars during fermentation are discussed.—H. G. Bray.

4044

- FAGEN, H. J., SIBBACH, E. and HUSSONG, R. V. **The use of anthrone for the quantitative estimation of lactose in dairy products.** *J. Dairy Sci.*, 1954, **37**, 10-13. [Kraft Foods Co. Res. Labs., Glenview, Ill.]

The method described may be used for the analysis of cheese, whole milk and non-fat dry milk solids, without deproteinisation. The sample, 0.1 g., is macerated with water and diluted to 1 litre and an aliquot containing 10 to 50 μg. lactose is treated with an anthrone-sulphuric acid reagent

and the colour formed on heating in a boiling-water bath is measured. In control experiments the recoveries of lactose added to dairy products ranged from 94 to 100 per cent. Results obtained by the method described agreed well with those given by a copper reduction method.—H. G. Bray.

4045

KNAUT, T. Próba ilościowego oznaczania laktozy w mleku. [Studies on the quantitative estimation of lactose in milk.] *Rocz. Nauk. rol.*, 1954, **67**, 269–280. Russian and English summaries.

The method of Benedict and Osterbert (*J. Biol. Chem.*, 1918, **34**, 195) has been adapted and the concentration of reagents, filters and extinction curves are described for colorimetric estimations with a Pulfrich photometer. (From English summary.)—D. Harvey.

4046

HUYGENS, R. and CASIMIR, J. Séparation chromatographique sur papier du saccharose, du glucose, du fructose et du sorbitol. [Chromatographic separation on paper of sucrose, glucose, fructose and sorbitol.] *Bull. Inst. agronom. Gembloux*, 1953, **21**, No. 3/4, 8–13.

Two techniques are described. In the first, two-dimensional chromatograms were prepared by a modification of the method of Jeanes *et al.* (Abst. 1274, Vol. 21). The solvents used were a mixture of benzene, butanol and pyridine and water (1:5:3:3) in one direction and a mixture of either fusel oil, pyridine and water (1:1:2) or of isopropanol, acetic acid and water (7:2:1) in the other. Two chromatograms were prepared. One was developed with sodium taurocholate followed by benzidine (*cf.* Horrocks, Abst. 3022, Vol. 19) and the other with silver nitrate to reveal sorbitol as described by Trevelyan *et al.* (Title 3059, Vol. 20). The second technique was one-dimensional for 150 hr., using the method with a tampon of cotton wool fixed at the bottom of the paper as described by Miettinen and Virtanen (*Acta chem. scand.*, 1949, **3**, 459). The solvent used was fusel oil, pyridine and water (1:1:2) or benzene, butanol, pyridine and water (1:5:3:3).

W. Godden.

4047

WYLAM, C. B. Analytical studies on the carbohydrates of grasses and clovers. 4. Further developments in the methods of estimation of mono-, di- and oligo-saccharides and fructosan. *J. Sci. Food Agric.*, 1954, **5**, 167–172. [Dept. Chem., Univ. Edinburgh.]

For previous parts see Absts. 27, Vol. 22; 1677, Vol. 24.

The oligosaccharides present in perennial ryegrass were examined and the presence of raffinose,

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melibiose and stachyose was established. A method for their estimation is described with minimum decomposition of fructose. A complete scheme is given for the estimation of a mixture of sugars in fresh and ensiled materials. The stability of different sugars to acid hydrolysis was studied, sugars being estimated by the Somogyi iodimetric method. Fructose was the only sugar to suffer decomposition. In a mixture of sugars subjected to electrodialysis for 30 min., ribose showed a preferential migration of 15 per cent. in relation to sucrose, glucose, fructose and xylose. The organic acids in silage were shown not to cause hydrolysis of sucrose or other labile substances under the conditions of the experiment.

D. M. Walker.

4048

KAHAN, J. Estimation of hexose diphosphate. *Arch. Biochem. Biophys.*, 1954, **48**, 331–337. [Dept. Pharmacol., Karolinska Inst., Fac. Med., Stockholm.]

The method is based on the estimation of the total carbohydrate, rather than the fructose, content of hexose diphosphate, with an anthrone reagent applied directly to a solution of the compound (5 to 400 μ g. per 1.5 ml.); the absorption of the reaction mixture at 625 m μ . is measured. The method is applicable also to a barium-insoluble, alcohol-insoluble fraction [LePage and Umbreit, *J. Biol. Chem.*, 1943, **147**, 263] of powdered tissue, a correction being applied for pentoses present in adenosinetri- and -diphosphates and similar compounds. The experimental error is 2.4 per cent.

H. G. Bray.

4049

SERRO, R. F. and BROWN, R. J. Improved chromatographic method for analysis of sugar beet products. *Anal. Chem.*, 1954, **26**, 890–892. [Res. Lab., The Great Western Sugar Co., Denver, Colo.]

Procedures are described for the chromatographic estimation of raffinose and of galactinol and inositol.—H. G. Bray.

4050

ELY, R. E. and MOORE, L. A. Isolation of holo-cellulose from various forages by the acid chloride method. *J. Animal Sci.*, 1953, **12**, 914–915. *Proc.* [U.S. Dept. Agric.]

4051

MOXON, A. L. and BENTLEY, O. G. Some discrepancies in A.O.A.C. crude fiber and N.F.E. values in roughages. *J. Animal Sci.*, 1953, **12**, 925. *Proc.* [Ohio Agric. Exp. Stat.]

4052

THACKER, E. J. **A modified lignin procedure.** *J. Animal Sci.*, 1954, **13**, 501-503. [U.S. Plant, Soil, Nutrit. Lab., Bur. Plant Indust., Ithaca, N.Y.]

The lignin method of Ellis *et al.* (Abst. 2495, Vol. 16) was modified (1) by the introduction of a treatment with 0.25 per cent. Na_2CO_3 as suggested by Forbes and Hamilton (Abst. 2363, Vol. 23) and (2) by the use of an autoclave for 10 min. at 20 lb. pressure instead of refluxing with acid for 1 hr. The treatment with Na_2CO_3 had the greater effect, reducing the crude lignin yield (by about 20 per cent.), and it is suggested that this probably reflects a reduced N content of the crude lignin. Autoclaving had only a small reducing effect on the lignin yield.—D. M. Walker.

Nitrogenous Constituents

4053

BRANDENBERGER, H. Über die Verwendung von Cellulose als Adsorbens für Blutplasma-Proteine aus wässriger Lösung. [On the use of cellulose as adsorbent for blood plasma proteins from aqueous solution.] *Helv. chim. Acta*, 1954, **37**, 97-103. [Theodor-Kocher-Inst., Univ. Berne.] English summary.

Cellulose powder retains fibrinogen but not the other main proteins of serum. Changes in the properties of globulins during chromatography are discussed.—H. G. Bray.

4054

HARDWICKE, J. **The estimation of serum proteins by electrophoresis on filter paper.** *Biochem. J.*, 1954, **57**, 166-171. [Dept. Exp. Pathol., Univ. Birmingham.]

An account of a procedure which is a modification of that of von Turba and Enekel (*Naturwissenschaften*, 1950, **37**, 93). Factors affecting accuracy were examined; the modification described was accurate to within 6 per cent. of the total amount of protein present.—H. G. Bray.

4055

McKINLEY, W. P., MAW, W. A., OLIVER, W. F. and COMMON, R. H. **The determination of serum protein fractions on filter paper electropherograms by the biuret reaction, and some observations on the serum proteins of the estrogenised immature pullet.** *Canad. J. Biochem. Physiol.*, 1954, **32**, 189-199. [Fac. Agric., McGill Univ., Macdonald Coll., Que.]

The protein is located on a reference electropherogram with naphthalene black and eluted with 1 per cent. saline from the appropriate parts of an unstained strip. A biuret reaction is applied to the eluate and the colour obtained is measured in a colorimeter. A comparison was made

between the mobilities of serum protein fractions from man and the domestic fowl, and observations on the serum proteins of immature pullets treated with oestrogen are reported.—H. G. Bray.

4056

DISCOMBE, G., JONES, R. F. and WINSTANLEY, D. P. (with DALY, C.) **The estimation of γ -globulin.** *J. Clin. Pathol.*, 1954, **7**, 106-109. [Central Middlesex Hosp., London.]

A method of electrophoresis on paper is described; the separated bands are stained with Lissamine green S.F. 130 and an approximate estimation of their protein content is made photometrically. The procedure is particularly useful in the diagnosis of myelomatosis and nephrotic nephritis. It is concluded that the Kunkel ZnSO_4 turbidity test (Abst. 145, Vol. 18), which gives similar results for γ -globulin, is more suitable than electrophoresis for following the progress of a disease.—H. G. Bray.

4057

NOVERRAZ, M. Détermination colorimétrique du rapport albumine/globuline dans le sérum sanguin. [Colorimetric estimation of the albumin: globulin ratio in blood serum.] *Schweiz. med. Wochenschr.*, 1953, **83**, 1092-1093. [Poliklin. Méd., Univ. Basle.]

4058

BETHEIL, J. J., JOHNSTON, H. W. and SCHLEGEL, J. U. **A micromethod for determination of human serum albumin.** *Federation Proc.*, 1954, **13**, 13. [Dept. Surg., Buswell Urol. Res. Lab., Sch. Med., Univ. Rochester, N.Y.]

4059

ADJUTANTIS, G. **Electrophoretic separation on filter paper of the soluble liver-cell proteins of the rat borate buffer.** *Nature*, 1954, **173**, 539-540. [Dept. Chem. Pathol., Postgrad. Med. Sch., Ducane Rd., London, W. 12.]

Concentration of liver proteins without denaturation is achieved by a combination of freeze-drying and homogenisation, soluble proteins being separated by fractional centrifuging. Electrophoresis revealed 5 main protein components.

H. G. Bray.

4060

BAKER, L. C., LAMPITT, L. H. and BROWN, K. P. **Connective tissue of meat. 3. Determination of collagen in tendon tissue by the hydroxyproline method.** *J. Sci. Food Agric.*, 1954, **5**, 226-231. [The Lyons Laboratories, 149 Hammersmith Rd., London, W. 14.]

Samples of collagen were prepared from defatted, freeze-dried tendon dissected from shin of beef by

treating the material in 0.1 *N* NaOH to remove cellular material and adhering muscle protein. It was washed and dissolved in 0.01 *N* HCl and the collagen was reprecipitated by neutralisation. Alternatively the method of Bowes and Kenten (Title 4494, Vol. 18) was used. The samples had a maximum hydroxyproline content of 13.2 per cent., which gave a factor of 7.57 for converting hydroxyproline to collagen. Estimation of hydroxyproline in a direct acid hydrolysate or in an acid hydrolysate of an aqueous autoclave extract gave comparable results. The results obtained by a modification of the method of Lowry *et al.* described by the present authors (Abst. 193, Vol. 23) gave slightly higher results.—W. Godden.

4061

ROSE, D. (TESSIER, H. and MARIER, J.) **Estimation of protein denaturation in frozen milk.** *Canad. J. Technol.*, 1954, **32**, 78-84. [Div. Appl. Biol., Nat. Res. Labs., Ottawa.]

An investigation was made of the conditions under which more exact information on protein denaturation might be obtained than that provided by the measurement of the volume of solids precipitated after standardised centrifuging. From the studies it was concluded that skimmed milk should be used, thawing should be for a fixed time at or below 4°C., temperature during treatment should be kept below 21°C., centrifuging should be for at least 10 min. at over 500 *g* at the tip of the tube and that after being mixed the supernatant milk should be analysed for total N and both loss of N and volume of precipitate should be recorded.—D. Harvey.

4062

SALWIN, H. **Biuret method for soluble whey proteins in nonfat dry milk solids.** *Food Res.*, 1954, **19**, 235-245. [Quartermaster Food and Container Inst. Armed Forces, Chicago, Ill.]

Protein in whey is precipitated with trichloroacetic acid, separated by centrifuging and dissolved in 3 per cent. NaOH and the intensity of the biuret colour produced on the addition of 5 per cent. CuSO₄ is measured at 560 mμ.

H. G. Bray.

4063

BABIN, V. A. and MUSERSKII, I. I. **Uskorennoe opredelenie belkov v golobykh blyudakh i ratzionakh. [The rapid estimation of proteins in prepared dishes and rations.]** *Vop. Pitan.*, 1954, **13**, No. 3, 34-40. [Nauch.-Issled. Sanit. Inst., Mosk. Oblast.]

The method of Djermillo gave results which, compared with results obtained by Kjeldahl analysis showed the method to be rapid and accurate. The method, which depends on fusing

with sodium hydroxide and fused sodium acetate, is described in detail, as is the construction of the apparatus.—D. W. Taylor.

4064

MILLER, S., RUTTINGER, V. E., KOVACH, E. S. and MACY, I. G. **The amino acids in nine food proteins as determined by three methods.** *Pan Amer. Med. Women's J.*, 1952, **59**, 9-13; 17; 24. [Res. Lab., Child. Fund Michigan, Detroit.]

Amino-acids were estimated in 6 food proteins, some of animal and others of vegetable origin. Of the 11 acids estimated, both microbiological and chromatographic methods were used for 5, microbiological alone for 4, chromatographic alone for 1 and microbiological and chemical for 1. Of 11 other co-operating laboratories 2 used only chemical and 9 only microbiological methods. The average and range values for these laboratories are given. Samples of edestin, gelatine, and casein and 2 of dried whole human milk were also analysed for 6 amino-acids. Certain more or less consistent differences between the results by microbiological and chromatographic methods were recorded for all foods, but the direction of difference varied with the amino-acid. It is concluded that both methods have inherent errors and that the value for an amino-acid in a protein can be considered as correct only if it is the same by both methods. Results for histidine in edestin and casein obtained by the chemical method were only about half those obtained by a microbiological method, though results for gelatine showed reasonably good agreement by both methods.—W. Godden.

4065

HESS, E. L. and YASNOFF, D. S. **A method for determining the solubility characteristics of components in protein mixtures.** *J. Amer. Chem. Soc.*, 1954, **76**, 931-933. [Rheumatic Fever Res. Inst., Northwestern Univ. Med. Sch., Chicago, Ill.]

4066

CROOK, E. M. and RABIN, B. R. **Colorimetric determination of dipeptide hydrolysis.** *Biochem. J.*, 1954, **57**, viii-ix. [Dept. Biochem., University Coll., London.]

4067

ROLAND, J. F. (Jr.) and GROSS, A. M. **Quantitative determination of amino acids using monodimensional paper chromatography.** *Anal. Chem.*, 1954, **26**, 502-505. [Dept. Biochem. Res., Armour Labs., Chicago, Ill.]

The 2 systems 2-butanol:3 per cent. NH₄OH (3:1) and 72 per cent. phenol resolve 16 amino-acids adequately for direct photometric measurement of the intensity of ninhydrin spots. Other

systems suitable for tryptophan and histidine are described.—H. G. Bray.

4068

MONTREUIL, M. and KHOUVINE, Y. Dosage des acides aminés par les complexes colorés dicétohydrin-dylidène - hydrindamine - sels de cadmium. [Estimation of amino-acids by the coloured complexes diketohydrindylidene-hydrindamine salts of cadmium.] *Bull. Soc. Chim. biol.*, 1954, **36**, 425-428. [Inst. Biol. Phys. Chim., Paris.]

The position of amino-acids separated by paper chromatography is revealed by dipping the sheet in an ethanolic solution of ninhydrin. The relevant portions are cut out and treated in a test tube with an aqueous methanolic solution of CdCl_2 . A red complex which is formed is eluted from the paper with methanol and estimated colorimetrically. The method is applicable to all common amino-acids except proline, hydroxyproline, cysteine, cystine and methionine.

H. G. Bray.

4069

BERLINGOZZI, S., RAPI, G. and MONTI, L. Cromatografia di ripartizione su striscia orizzontale e sua applicazione al dosaggio di aminoacidi. [Partition chromatography on horizontal strips and its application to the estimation of amino-acids.] *Sperimentale*, 1953, **4**, 27-37. [Ist. Chim. Organ., Univ. Florence.]

4070

BONETTI, E. and DENT, C. E. The determination of the optical configuration of naturally occurring amino acids using specific enzymes and paper chromatography. *Biochem. J.*, 1954, **57**, 77-81. [Med. Unit, University Coll. Hosp., London, W.C. 1.]

4071

ROINE, P., GYLLENBERG, H. and SALAKIVI, V. Determination of "Streptogenin" with *Lactobacillus bifidus*. *Acta chem. scand.*, 1954, **8**, 161-165. [Dept. Nutrit. Chem., Univ. Helsinki.]

It has previously been shown that streptogenin is essential for the growth of *Lactobacillus bifidus* (Gyllenberg *et al.*, *Acta chem. scand.*, 1953, **7**, 694). Three strains were isolated from the faeces of breast-fed infants incubated in the medium of Hassinen *et al.* (Abst. 368, Vol. 22). Tests with these in which the anaerobic conditions required by *L. bifidus* were established by using a large inoculum showed that, as a test organism, it has the following advantages: the blank values are always very small, the growth response is pronounced and the basal medium is simple. Figures

obtained for the streptogenin activity of 13 different preparations are in good agreement with those obtained by the *L. casei* method of Kodicek and Mistry (Abst. 1594, Vol. 22).—W. Godden.

4072

THUILLIER, Y., FAUCONNEAU, G., DE PRAILAUNE, S., CHEVILLARD, L. and ROCHE, J. Dosage de la méthionine dans les produits végétaux employés dans l'alimentation animale. [Estimation of methionine in plant products used in animal nutrition.] *Ann. Zootec.*, 1954, **3**, 29-45. [Lab. Biochim. Gen. Comparée, Coll. France.]

Methionine in vegetable feedingstuffs was estimated microbiologically, with *Lactobacillus arabinosus* 17/5, *Leuconostoc mesenteroides* P-60 or *Lactobacillus fermenti* 36. From these studies *L. mesenteroides* proved the most specific, but it could not be used for fodders poor in N. *L. arabinosus* was most generally useful and details are given of conditions of hydrolysis. *L. fermenti* was less sensitive. Results for yeasts, oilcakes, grains, and fresh and dry fodders agreed with those of Singleton *et al.* (Abst. 1465, Vol. 23) and Armstrong (Abst. 1548, Vol. 21).—M. B. Richards.

4073

SCHORMÜLLER, J. and LEICHTER, L. Die Wirkung verschiedener Hydrolysebedingungen auf die Freisetzung von Lysin aus Casein. [Effect of different conditions of hydrolysis on the liberation of lysine from casein.] *Ztschr. Lebensmittel-Untersuch. Forsch.*, 1953, **97**, 446-456. [Inst. Lebensmittelchem., Tech. Univ., Berlin-Charlottenburg.]

Investigations were made on the enzymic and chemical liberation of lysine from casein under different conditions of hydrolysis. Treatment with tryptic enzymes and papain gave the highest yields of free lysine, treatment with pepsin the lowest. Acid hydrolysis with HCl, HBr, HI, formic acid, or a mixture of formic acid and HCl, showed that the usual procedure under normal pressure liberated the whole of the lysine present in the casein. Conditions were established for the optimum liberation of lysine under hydrolysis with HCl or HBr in the autoclave, and the extent of lysine destruction and racemisation was estimated. Alkaline hydrolysis with NaOH led to considerable destruction of lysine. By combining an enzymic and a chemical method of lysine estimation, a reliable estimate could be obtained of the yield of natural L-lysine, and of the amounts racemised and destroyed.—M. B. Richards.

4074

SCHRAM, E., MOORE, S. and BIGWOOD, E. J. Chromatographic determination of cystine as

N.A. and R., October 1954

cysteic acid. *Biochem. J.*, 1954, **57**, 33-37.

[Lab. Biochem., Fac. Med., Univ. Brussels.]

The protein is oxidised with performic acid and hydrolysed and the cysteic acid formed is separated on a column of a basic ion exchange resin (Dowex) and eluted with chloroacetic acid. The cysteic acid in the appropriate fractions is estimated by a ninhydrin method.—H. G. Bray.

4075

STRICKLAND, R. D., MARTIN, E. L. and RIEBSOMER, J. L. **A method for the independent determination of cysteine and cystine in proteins.** *J. Biol. Chem.*, 1954, **207**, 903-910. [Dept. Chem., Univ. New Mexico, Albuquerque.]

The method is based on the condensation of the cysteine sulphhydryl groups in the intact protein with formaldehyde, with which cystine does not react. The mixture is then hydrolysed with 6 N HCl and cystine is precipitated as cuprous mercaptide. This is filtered off and converted in a Parr bomb to sulphate and weighed as such. Methionine, after demethylation, is removed by precipitation with cuprous copper. The filtrate, which contains the cysteine as thiazolidinecarboxylic acid, is evaporated to dryness and the residue is ashed in a Parr bomb, the S being weighed as BaSO₄. Recovery experiments under a variety of conditions gave figures of 95 to 103 per cent. for samples containing about 20 mg. cystine plus cysteine.—C. Warner.

4076

HARDY, T. L. and HOLLAND, D. O. **An improved separation of DL-threonine from DL-allo-threonine by paper chromatography.** *Chem. and Indust.*, 1954, No. 18, 517-518. [Med. Chem. Div., Beecham Research Laboratories, Ltd., Betchworth, Surrey.]

The solvent mixture recommended is cyclohexylamine, water, methyl ethyl ketone, butanol (1:2.5:5:5) on Whatman paper No. 1 for 16 hr. The *R_F* values of threonine and allothreonine are 0.54 and 0.41, respectively.—H. G. Bray.

4077

KAPFFHAMMER, J. **2.4.6.-Trinitro-benzoesäure als Fällungsmittel für L-Prolin. [2:4:6-Trinitrobenzoic acid as a precipitant for L-proline.]** *Hoppe-Seyler's Ztschr.*, 1953, **295**, 413-414. [Physiol. Chem. Inst., Univ. Freiburg i. Br.]

Proline dissolved in a small quantity of alcohol is precipitated by an alcoholic solution of 2:4:6-trinitrobenzoic acid to the extent of 83 to 89 per cent. It can be recovered from the precipitate by boiling with dioxane under a reflux condenser for 1 hr.—W. Godden.

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4078

KEMBLE, A. R. and MACPHERSON, H. T. **Determination of monoamino monocarboxylic acids by quantitative paper chromatography.** *Biochem. J.*, 1954, **56**, 548-555. [Dept. Chem., King's Bldgs., Univ. Edinburgh.]

Neutral amino-acids are isolated by ionophoresis and separated by paper chromatography. The eluted acids are estimated by a chloramine-T manometric method.—H. G. Bray.

4079

VAN PILSUM, J. **Methods for determination of creatine and creatinine in biological fluids.** *Federation Proc.*, 1954, **13**, 313-314. [Dept. Biol. Chem., Coll. Med., Univ. Utah, Salt Lake City.]

Lipoid Constituents

4080

Festlegung von Standardmethoden auf dem Milchgebiet. [Fixing standard methods for milk analysis.] *Ztschr. Lebensmittel-Untersuch. Forsch.*, 1954, **98**, 358-363.

This is a report by a Commission appointed for the purpose and gives details for the official methods for estimating fat in milk and skimmed milk by the Röse Gottlieb procedure and for fat in milk by the Gerber procedure. Two appendixes give rules for sampling milk and milk products and for sampling milk for fat estimation.—W. Godden.

4081

LYONS, J. and O'SHEA, M. J. **Factors affecting the Gerber weighing method of testing cream.** *J. Dept. Agric., Republic of Ireland*, 1952-53, **49**, 56-81. [Dept. Dairy Technol., University Coll., Cork.]

This is a critical examination of the estimation of fat in cream by the Gerber method under conditions laid down by the Department of Agriculture, Ireland, 1937, Bull. No. 4, and by the British Standards Institution (Abst. 2910, Vol. 6), respectively. It is shown that in both cases there are numerous sources of error, which under practical conditions with the Irish method may lead to limits of variation of ± 1.26 per cent. in the fat reading from the true average fat reading and with the British Standard method of ± 1.66 per cent. With the Irish method, under commercial conditions, 75.4 per cent. of the tests should not differ by more than 0.5 per cent. and 99.7 per cent. by not more than 1.0 per cent. from the true average reading. With the British method the figures would be 47.2 per cent. and 98.3 per cent. for the same limits.—W. Godden.



4082
BRONISZ, H. and RACIBORSKA, I. Uwagi o metodach oznaczania liczby nadtlenkowej. [Some observations on the methods of estimating peroxide number (Lea number).] *Rocz. Państwowego Zakł. Hig.*, 1954, **5**, 115-123. [Akad. Med., Warsaw.] Russian and English summaries.

4083
CECCALDI, P. F., WEGMANN, R. and BIEZ-CHARRETON, J. Chromatographie sur papier des lipides. [Paper chromatography of lipids.] *Bull. Soc. Chim. biol.*, 1954, **36**, 415-424. [Lab. Biol., Fac. Méd., Paris.]

Mixtures of fatty acids are chromatographed on paper impregnated with liquid paraffin (Nujol) using 90 per cent. methanol as the mobile phase. The resulting acid zones are located by treating the paper with ammoniacal AgNO_3 solution, then washing with water and treating with ammonium sulphide, which reveals the zones as brown-black spots.

Separations of stearic, oleic, capric and undecylic acids are described. Four acids were separated from hydrolysed snake fat.—G. A. Garton.

4084
NIJKAMP, H. J. A simple chromatographic method for the determination of the saturated straight-chain fatty acids C_{10} - C_{24} . *Anal. chim. Acta*, 1954, **10**, 448-458. [Lab. Animal Physiol., Agric. Univ. Coll., Wageningen.] French and German summaries.

The column used is prepared from silica gel suspended in ammoniacal methanol and tinted with a suitable indicator. The developing solvent is iso-octane and development is under a pressure of nitrogen. The bands are visible as they proceed along the column and can be collected and titrated in single fractions.—H. G. Bray.

4085
RADELL, J. and DONAHUE, E. T. Potentiometric nonaqueous titration of substituted fatty acids. *Anal. Chem.*, 1954, **26**, 590-591. [E. Reg. Lab., Philadelphia 18, Pa.]

The acid sample is dissolved in benzene-methanol containing lithium chloride. The solution is magnetically stirred during potentiometric titration.
H. G. Bray.

4086
HANSEN, R. P., SHORLAND, F. B. and COOKE, N. J. The branched-chain fatty acids of butterfat. 4. The isolation of (+)-12-methyltetradecanoic acid and of 13-methyltetradecanoic acid. *Biochem. J.*, 1954, **57**, 297-301. [Fats Res. Lab., D.S.I.R., Wellington, N.Z.]

For the preceding study see Abst. 1629, Vol. 24.

Butterfat glycerides were hydrogenated and then saponified. The resulting fatty acids were resolved into "liquid" and "solid" acids by repeated crystallisation from acetone at -33°C . By a combination of techniques, distillation *in vacuo*, low-temperature crystallisation and chromatography on Al_2O_3 , the methyl esters of the "liquid" acids were resolved into many fractions, from 2 of which (+)-12-methyltetradecanoic acid and 13-methyltetradecanoic acid were isolated.
G. A. Garton.

4087
HARPER, W. J. and ARMSTRONG, T. V. Measurement of butyric acid in fat with reference to the detection of substitute fats in dairy products. *J. Dairy Sci.*, 1954, **37**, 481-487. [Dept. Dairy Technol., Inst. Nutrit. Food Technol., Ohio State Univ.]

4088
LEA, C. H. and RHODES, D. N. Determination of the iodine value of phospholipids. *Analyst*, 1954, **79**, 304-305. [Low Temp. Res. Stat., Univ. Cambridge.]

Though it has become customary to measure the iodine value of phospholipins by the Yasuda technique (*J. Biol. Chem.*, 1931, **94**, 401), a re-examination of the method as applied to egg phospholipins and methyloleate, linoleate and linolenate gave low results. It is suggested that the wellknown methods of Wijs or Hanus, suitably scaled down, are to be preferred to the Yasuda method, except possibly when a crude lipid containing sterols in quantity is being examined.
G. A. Garton.

4089
ROUSER, G., MARINETTI, G. and BERRY, J. F. Paper chromatography of phospholipids. *Federation Proc.*, 1954, **13**, 286. [Dept. Biochem., Sch. Med. Dent., Univ. Rochester, N.Y.]

4090
LEA, C. H. and RHODES, D. N. Phospholipids. 2. Estimation of amino nitrogen in intact phospholipids. *Biochem. J.*, 1954, **56**, 613-618. [Low Temp. Res. Stat., Univ. Cambridge.]

4091
GERTLER, M. M., KREAM, J. and BATURAY, O. Studies on the phosphatide content of human serum. *J. Biol. Chem.*, 1954, **207**, 165-173. [Dept. Biochem., Home for Aged and Infirm Hebrews, New York.]

A micro-method is described for the analysis of plasma phospholipins. A mixture of ethanols and ether is used to extract the phospholipins, which are then hydrolysed for 48 hr. to yield free serine,

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ethanolamine and choline. The bases are separated on paper chromatograms with a mixture of *n*-butanol, diethylene glycol and water, 4:1:1 by volume, as solvent. Serine and ethanolamine are quantitatively estimated by development of the adsorbed zones with ninhydrin, followed by extraction of the coloured areas with aqueous pyridine and measurement of the intensity of absorption at 580 $m\mu$. in a Beckman spectrophotometer. Choline is estimated on separate chromatograms according to the method of Levine and Chargaff (Abst. 4478, Vol. 21).

A few representative analysis of human serum phospholipins are given, showing that choline-containing phospholipins are the major constituent. G. A. Garton.

4092

BEST, M., VAN LOON, E. J., WATHEM, J. and SEGER, A. J. **Comparison of serum cholesterol methods.** *Amer. J. Med.*, 1954, **16**, 601. *Proc. [Inst. Med. Res., Sch. Med., Univ. Louisville, Ky.]*

4093

MACINTYRE, I. and RALSTON, M. **Direct determination of serum cholesterol.** *Biochem. J.*, 1954, **56**, xliii. [Postgrad. Med. Sch., London, W. 12.]

4094

ROSENFELD, R. S., HELLMAN, L., CONSIDINE, W. J. and GALLAGHER, T. F. **Isolation of radioactive cholesterol from plasma.** *J. Biol. Chem.*, 1954, **208**, 73-84. [Sloan-Kettering Inst. Cancer Res., New York.]

Other Organic Constituents

4095

MARKEES, S. **Chromatography of pyruvic acid and of acetoacetic acid as their 2:4-dinitrophenylhydrazones.** *Biochem. J.*, 1954, **56**, 703-704. [Med. Labs., F. Hoffmann-La Roche and Co., Ltd., Basle.]

Paper chromatography of the 2:4-dinitrophenylhydrazone of pyruvic acid using a butanol: ammonia: water mixture as developing solvent gives 2 spots, one of which has an R_f value somewhat similar to that of the 2:4-dinitrophenylhydrazone of acetoacetic acid. The normal product obtained by reaction of blood acetoacetic acid with 2:4-dinitrophenylhydrazine is, however, the hydrazone of acetone, which gives a spot quite distinct from either of the pyruvic acid spots. Acetoacetic acid 2:4-dinitrophenylhydrazone is formed only when the concentration of blood acetoacetic acid is high.—H. G. Bray.

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4096

BECKER, E. **Der papierchromatographische Nachweis wasserlöslicher organischer Säuren in Lebensmitteln. [Detection of water-soluble organic acids in foods by paper chromatography.]** *Ztschr. Lebensmittel-Untersuch. Forsch.*, 1954, **98**, 249-257. [Deutsch. Arkady-Gesellsch. m.b.H., Hanover.]

4097

ROBERTS, E. J. and MARTIN, L. F. **Identification and determination of nonnitrogenous organic acids of sugar cane by partition chromatography.** *Anal. Chem.*, 1954, **26**, 815-818. [Sugarcane Products Div., S. Reg. Lab., New Orleans, La.]

The method used is based on that of Marvel and Rands (*J. Amer. Chem. Soc.*, 1950, **72**, 2642). A silicic acid column is used, the eluting solvents being mixtures of chloroform and *n*-butanol. The procedure was applied to the separation of syringic, mesaconic, fumaric, succinic, aconitic, glycollic, malic, citric and oxalic acids.—H. G. Bray.

4098

FELDSTEIN, M. and KLENDSHOJ, N. C. **Determination of methanol in biological fluids by microdiffusion analysis.** *Anal. Chem.*, 1954, **26**, 932-933. [Div. Toxicol., Sch. Med., Univ. Buffalo, N.Y.]

4099

KEIDERLING, W. and WÖHLER, F. **Zur Physiologie und Pathologie des Speichereisens. 1. Eine Methode zur quantitativen Bestimmung des Ferritins. [Physiology and pathology of storage of iron. 1. Method for quantitative estimation of ferritin.]** *Arch. exp. Pathol. Pharmacol.*, 1954, **221**, 418-433. [Klin. Med., Univ. Freiburg i. Br.]

Inorganic Constituents

4100

VANATTA, J. C. and CUSHING, I. **The determination of total base serum with an ion exchange resin conditioned as iodate.** *J. Biol. Chem.*, 1954, **208**, 195-204. [Dept. Physiol., Southwestern Med. Sch., Univ. Texas, Dallas.]

The use of a Rohm and Haas IRA-400, analytical grade resin in the hydroxyl form is recommended. It is conditioned by running slowly through 200 ml. of the resin in a column 30 to 40 mm. in diameter, 9200 ml. of 5 per cent. KIO_3 . Such a resin has the advantage over that recommended by Polis and Reinhold (Abst. 2921, Vol. 14) that it will react stoichiometrically with both carbonate and bicarbonate and the iodate liberated can be estimated accurately by standard analytical methods. It can be used for fresh or ashed serum, but in

unashed sera the results are on the average 4.8 m. equiv. per litre lower than those for the same sera estimated by the ashing method. The method on fresh and ashed serum was compared for 11 normal samples and 8 from hospital patients with the ashing method of Hald (Abst. 3857, Vol. 3) and good agreement was found between the results by the ashing methods.—W. Godden.

4101

STACY, B. D. **The colorimetric estimation of aluminium.** *Biochem. J.*, 1954, **56**, xlvii. [Postgrad. Med. Sch., London, W. 12.]

4102

TUPALSKA, M. W sprawie oznaczania arsenu w niektórych artykułach żywności. [On the estimation of the arsenic content of some food products.] *Rocz. Państwowego Zakł. Hig.*, 1954, **5**, 39–51. [Z Zakładu Badania Żywności i Przedmiotów Użytku PZH.] Russian and English summaries.

A modification of the method outlined by Treadwell (*Kurzes Lehrbuch der analytischen Chemie*, 1921) is described in the original. Ashing was with MgO, NH_4NO_3 and HNO_3 .

A method for the estimation of As in food products without ashing is also described. It was used for the analysis of baking powder, lactic acid and vinegar. (From summary.)—W. Godden.

4103

EVANS, R. J. and BANDEMER, S. L. **Determination of arsenic in biological materials.** *Anal. Chem.*, 1954, **26**, 595–598. [Dept. Agric. Chem., Michigan State Coll., East Lansing.]

4104

LLAURADO, J. G. **Simplified estimation of calcium in biological materials by flame photometry.** *J. Clin. Pathol.*, 1954, **7**, 110–115. [Postgrad. Med. Sch., London.]

4105

TEERI, A. E. **Colorimetric determination of blood calcium with chloranilic acid.** *Chemist Analyst*, 1954, **43**, 18–21. [Univ. New Hampshire, Durham.]

A modification of the method of Tyner (Abst. 94, Vol. 18) for the estimation of Ca in plant materials. Ca is precipitated from serum as oxalate, which is isolated, washed and transferred to a volumetric flask. A solution of chloranilic acid is added and the diminution in colour produced in 4 hr. is measured. The values obtained are in good agreement with those obtained by a titrimetric method.

H. G. Bray.

4106

MACINTYRE, I. **The determination of serum calcium with a flame spectrophotometer.** *Biochem. J.*, 1954, **56**, xliii–xliv. [Postgrad. Med. Sch., London, W. 12.]

4107

LEWIS, M. S. and KERWIN, T. D. **Photometric determination of calcium and magnesium.** *Federation Proc.*, 1954, **13**, 89. [Nat. Insts. Health, Bethesda, Md.]

4108

KIMBEL, K. H. Die Reaktionsbedingungen der mercurimetrischen Chloridtitration in biologischen Flüssigkeiten. [Reaction conditions for the mercurimetric titration of chloride in biological fluids.] *Hoppe-Seyler's Ztschr.*, 1953, **295**, 132–140. [Med. Poliklin., Univ. Würzburg.]

4109

CHANIN, M. **The determination of chloride by use of the silver-silver chloride electrode.** *Science*, 1954, **119**, 323–324. [Lab. Thoracic Surg. Res., City of Hope Med. Centre, Duarte, Calif.]

A potentiometric method is described which enables an estimation to be made within one minute.—H. G. Bray.

4110

ROECKEL, I. E. **Rapid bedside test for serum chloride and bicarbonate: a further investigation of Scribner's method.** *Amer. J. Med. Sci.*, 1954, **227**, 426–430. [Med. Serv., New York City Hosp.]
See Title 1444, Vol. 20.

4111

SHENK, W. D. **Tissue chloride.** *Arch. Biochem. Biophys.*, 1954, **49**, 138–148. [Zool. Lab., Univ. Pennsylvania, Philadelphia.]

Because of doubts about the accuracy of the Van Slyke method for chloride when applied to tissue, chloride was estimated by the Volhard method or gravimetrically in wet and dry frog muscle after ashing in the Parr bomb or the micro-Carius furnace. There was good agreement between the 2 methods of ashing, but the results were at least 100 per cent. higher than those by the Van Slyke method. For blood of 5 species. however, the values obtained by the micro-Carius method were in agreement with values in the literature obtained by the Van Slyke method. It is suggested that tissue chloride not detected by the Van Slyke method may be present as chloranil.

Values for the chloride content of a number of wet tissues of dog and rabbit are given.

W. M. Deans.

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4112

BELCHER, R., NUTTEN, A. J. and STEPHEN, W. I. **Determination of chlorine in water. Suggested use of 3, 31-dimethylnaphthidine.** *Anal. Chem.*, 1954, **26**, 772-773. [Dept. Chem., Univ. Birmingham, Edgbaston.]

4113

SCHÜRCH, A., BARBORIAK, J. and FINDRIK, M. Neuere Erfahrungen mit der kolorimetrischen Chromoxydbestimmung. Verwendung des Chromoxyds als Leitsubstanz bei Verdauungsversuchen an Kaninchen. [Colorimetric estimation of chromic oxide. Use of chromic oxide as marker in digestion experiments with rabbits.] *Mitt. Geb. Lebensmittel. Hyg.*, 1954, **45**, 66-71. *Proc.* [Zürich.]

4114

POHL, F. A. and DEMMEL, H. Die mikrophotometrische Bestimmung von Kobalt im Blutserum und anderen biologischen Substanzen. [Microphotometric estimation of cobalt in blood serum and other biological materials.] *Anal. chim. Acta*, 1954, **10**, 554-561. [Inst. Mikrochem., Tech. Hochschule, Graz.] English and French summaries.

Fe and Cu in an ash sample are removed by means of oxine and dithizone and may be estimated if required. Co is then converted into its complex with diethyldithiocarbamate and extracted with CHCl_3 . Organic matter in this extract is destroyed and Co is estimated by a nitroso-R-salt method. The method is applicable to 0.02 to 0.3 μg . Co with accuracy ± 5 per cent.—H. G. Bray.

4115

WISE, W. M. and BRANDT, W. W. **Spectrophotometric determination of cobalt with 2-nitroso-1-naphthol-4-sulfonic acid.** *Anal. Chem.*, 1954, **26**, 693-697. [Dept. Chem., Purdue Univ., Lafayette, Ind.]

The solution containing Co is treated directly with an aqueous solution of the reagent, the pH is adjusted to 7 with NaOH and the absorbancy of the mixture is measured at 525 m μ . Procedures are described for the removal of Ni and the prevention of interference by ferric iron and Cu up to concentrations of $1.0 \times 10^{-3} M$.—H. G. Bray.

4116

WILLIAMS, T. R. and MORGAN, R. R. T. **A rapid method for the determination of copper in plant material.** *Chem. and Indust.*, 1954, No. 16, 461. [Nat. Agric. Advisory Serv., Wye, Kent.]

The plant material, 2 g., is wet ashed and a solution of the ash is treated with bis-cyclohexanone-oxalyldihydrazone in the presence of ammonium

citrate and ammonia. The blue colour produced is measured spectrophotometrically at 595 m μ . In 14 control experiments recoveries of Cu, 30 p.p.m. added to plant ash solutions, ranged from 97 to 102 per cent.—H. G. Bray.

4117

JENKINS, E. N. **The absorptiometric determination of traces of copper in highly purified water.** *Analyst*, 1954, **79**, 209-216. [Atomic Energy Res. Establishment, Harwell, Nr. Didcot, Berks.]

The method described is applicable to concentrations of Cu as small as 0.001 p.p.m. A sample, 500 ml., of the water to be tested is treated with 0.5 g. disodium ethylenediamine tetra-acetate and a citrate buffer and extracted with 10 ml. chloroform. The organic phase is separated and the extracted Cu complex is estimated photoabsorptometrically.—H. G. Bray.

4118

PETERSON, R. E. and BOLLIER, M. E. **Determination of serum copper with bis-cyclohexanone-oxalyldihydrazone.** *Federation Proc.*, 1954, **13**, 472-473. [Nat. Inst. Arthritis Metabol. Dis., Nat. Inst. Health, Bethesda, Md.]

4119

KAHLE, G. and REIF, E. Die Bestimmung von Kupfer, Blei und Zink im Blutplasma unter Anwendung der Polarographie und des Kationenaustauschers. [Estimation of copper, lead and zinc in blood plasma by polarography and cation exchange.] *Biochem. Ztschr.*, 1954, **325**, 380-388. [Rudolf Virchow Krankenhaus, Berlin.]

An ion exchange resin (Wofatit KS), is used either to remove phosphate from the ashed plasma or to isolate directly from the plasma or serum the elements to be estimated. The polarographic procedure is described in detail.—H. G. Bray.

4120

VENKATESWARLU, P. and NARAYANA RAO, D. **Estimation of fluorine in biological material.** *Anal. Chem.*, 1954, **26**, 766-767. [Dept. Biochem., Med. Coll., Trivandrum, India.]

The material is distilled with H_2SO_4 and the fluoride in the distillate is adsorbed on MgO in alkaline solution. The solid material is separated and distilled with perchloric acid in the presence of silver and barium perchlorates and the fluoride in the distillate is estimated titrimetrically.

H. G. Bray.

4121

MACNULTY, B. J., REYNOLDS, G. F. and TERRY, E. A. **The polarographic determination of fluoride. 1. Basic principles of the method:**

application to the cathode-ray polarograph. *Analyst*, 1954, **79**, 190-198. [Chem. Inspectorate, Station Approach Bldgs., Kidbrooke, London, S.E. 3.]

The method described in detail is based on the depression by fluoride of the polarographic "step" due to the reduction of the aluminium-Solochrome Violet R.S. complex. There is a direct relationship between the amount of fluoride and the depression of the step, down to a concentration of fluoride of 0.001 $\mu\text{g.}$ per ml.—H. G. Bray.

4122

SINGER, L. and ARMSTRONG, W. D. **Determination of fluoride. Procedure based upon diffusion of hydrogen fluoride.** *Anal. Chem.*, 1954, **26**, 904-906. [Dept. Physiol. Chem., Univ. Minnesota, Minneapolis.]

An apparatus constructed from polyethylene is described. HF is liberated from the sample by perchloric acid and allowed to diffuse at 50° C. into alcoholic NaOH. The NaF formed is eluted with water and estimated titrimetrically.

H. G. Bray.

4123

NICHOLS, M. L. and CONDO, A. C. (Jr.) **Colorimetric determination of fluoride.** *Anal. Chem.*, 1954, **26**, 703-707. [Cornell Univ., Ithaca, N.Y.]

The method depends on the bleaching effect of fluoride on complexes of ferric iron with 5-phenylsalicylate or resacetophenone and may be used to estimate fluoride concentrations up to 6 p.p.m. Other ions which form complexes with ferric iron interfere, as does aluminium in high concentrations.

H. G. Bray.

4124

CARGILL, W. H., PAYNE, A. and DRATZ, A. F. **Differential counting of I^{131} and Cr^{51} in single samples of whole blood.** *Amer. J. Med.*, 1954, **16**, 602. *Proc.* [Radioisotope Unit, Veterans Admin. Hosp., Atlanta, Ga.]

4125

BECKWITH, R. S. **The absorptiometric determination of iron using cupferron.** *Chem. and Indust.*, 1954, No. 23, 663. [Div. Soils, C.S.I.R.O., Adelaide.]

The plant material, 0.5 to 1.0 g. containing 20 to 150 $\mu\text{g.}$ Fe, is wet ashed and the digest is diluted and treated with a 6 per cent. solution of cupferron in the presence of ammonium citrate. The iron cupferrate is extracted with amyl acetate and estimated absorptiometrically at 460 $\text{m}\mu$.

H. G. Bray.

4126

HORIUCHI, K., TAKADA, I. and TAMORI, E. [A modified mixed-colour dithizone method for the estimation of lead in biological materials. (For the standardisation of methods for estimating lead in biological materials.)] *J. Osaka City Med. Center*, 1953, **2**, 97-103. (English summary pp. 152-153). [Dept. Prevent. Med., Osaka City Med. Sch.]

The method [not described in the summary] is stated to be capable of estimating 2 to 50 $\mu\text{g.}$ Pb with an accuracy of 96 per cent. (From summary).

W. Godden.

4127

LOCKWOOD, H. C. **Determination of lead in foodstuffs.** *Analyst*, 1954, **79**, 143-146. [Chemists' Dept., Cadbury Brothers, Ltd., Birmingham 30.]

4128

ELVIDGE, D. A. and GARRATT, D. C. **A note on a bomb technique for preparing samples for determination of lead in foodstuffs.** *Analyst*, 1954, **79**, 146-147. [Standards Dept., Boots Pure Drug Co., Ltd., Nottingham.]

4129

MITCHELL, T. A. **The spectrophotometric determination of magnesium with thiazol yellow dyes.** *Analyst*, 1954, **79**, 280-285. [Dept. Agric., Rukuhia Soil Res. Stat., Hamilton, N.Z.]

The thiazole yellow method is critically discussed. A procedure is described whereby Mg is precipitated as its ammonium phosphate, redissolved, and estimated in this solution. Starch is used as a protective colloid and glycerol to stabilise the colour. In 14 control experiments the recovery of Mg, 30 to 60 $\mu\text{g.}$ added to plant extracts, ranged from 93 to 107 per cent. The standard deviations of 10 estimations made on 10 dilutions of a standard solution with 116 $\mu\text{g.}$ per ml. ranged from 1.2 to 6.9.

H. G. Bray.

4130

JOHNSON, C. M. and ARKLEY, T. H. **Determination of molybdenum in plant tissue.** *Anal. Chem.*, 1954, **26**, 572-574. [Dept. Plant Nutrit., Univ. California, Berkeley 4.]

The thiocyanate-molybdenum complex is extracted from the reaction mixture by a mixture of iso-amyl alcohol and carbon tetrachloride and the absorption of the extract is measured spectrophotometrically at 470 $\text{m}\mu$.—H. G. Bray.

4131

JONES, G. B. **The polarographic estimation of molybdenum in plant materials.** *Anal. chim.*

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Acta, 1954, **10**, 584-590. [Div. Biochem., C.S.I.R.O., Univ. Adelaide.] French and German summaries.

Molybdenum is extracted from acid digests by α -benzoinoxime and CHCl_3 . The extract is decomposed by H_2SO_4 , HNO_3 and perchloric acid, the metallic residue is dissolved in H_2SO_4 and the Mo is estimated polarographically in terms of the catalytic wave in an H_2SO_4 -perchlorate supporting electrolyte.—H. G. Bray.

4132

GACHON, L. Sur le dosage de l'acide phosphorique par le phosphomolybdate d'ammonium; examen critique de quelques méthodes d'analyse quantitative. [Estimation of phosphoric acid with ammonium phosphomolybdate. Critical examination of some methods of quantitative analysis.] *Ann. agronom.*, 1954, **5**, 259-283. [Stat. Agronom., Clermont-Ferrand.]

A critical study of 4 methods proposed long ago for this estimation was made. A technique was proposed which combines in part the methods of Von Lorenz and Scheffer (*Die Landw. Versuchst.*, 1901, **55**, 183; 1927, **105**, 335) and that of Maume *et al.* (*Ann. École nat. Montpellier*, 1934, **23**, 1). Application of the method to the estimation of P_2O_5 in extracts of soil or in plants is briefly outlined.—W. Godden.

4133

FLECKENSTEIN, A. and JANKE, J. Papierchromatographische Trennung von ATP, ADP und anderen Phosphor-Verbindungen im kontrahierten und erschlaferten Froschmuskel. [Separation of ATP, ADP and other phosphorus compounds in contracted and relaxed frog muscle by paper chromatography.] *Pflügers Arch.*, 1953-54, **258**, 177-199. [Pharmakol. Inst., Univ. Heidelberg.]

4134

AMIN, A. M. Rapid micro-volumetric determination of potassium in plants using sodium tetraphenylboron as precipitant. *Chemist Analyst*, 1954, **43**, 4-6. [Dept. Chem. Eng., Univ. Cairo, Giza.]

The plant material is ashed, the ash extracted with HCl and the potassium in the filtrate is precipitated with a 3 per cent. solution of sodium tetraphenylboron. The precipitated salt is isolated and estimated by the method of Flaschka and Amin (Abst. 1541, Vol. 24) or that of Flaschka *et al.* (*Ztschr. anal. Chem.*, 1953, **138**, 241).

H. G. Bray.

4135

WOLFF, H. Untersuchungen über die Bestimmung von Zink mit Dithizon in biologischen Präparaten. [Estimation of zinc with dithizone in biological preparations.] *Biochem. Ztschr.*, 1954, **325**, 267-279. [Med. Poliklin., Univ. Marburg a.d. Lahn.]

A procedure is described for the estimation of amounts of Zn as small as 0.1 μg . with a maximum error of ± 2.2 per cent.—H. G. Bray.

Enzyme Activity

4136

LINDNER, J. Bestimmung proteolytischer Verdauungsfermente. [Estimation of proteolytic digestive enzymes.] *Arch. exp. Pathol. Pharmacol.*, 1954, **222**, 242-244. *Proc. [Uetersen.]*

4137

KAZMEIER, F. and STAHLBERG, C. Eine einfache Methode zur quantitativen Bestimmung des Pepsins im Magensaft. [Simple method of estimating pepsin in gastric juice.] *Klin. Wochenschr.*, 1954, **32**, 85-87. [2. Med. Klin., Med. Akad., Düsseldorf.]

4138

BISHOP, J. G. and RICHARDSON, A. W. A practical accurate method for measuring and recording the activity of proteolytic enzymes. *J. Lab. Clin. Med.*, 1954, **43**, 327-331. [Dept. Physiol., Sch. Med., Indiana Univ., Bloomington.]

4139

KOCH, R. B., FELSHER, A. R., BURTON, T. H. and LARSEN, R. A. A rapid method for the determination of cereal lipase activity. *Cereal Chem.*, 1954, **31**, 113-120.

The substrate is a butterfat emulsion buffered at pH 7.9. Lipolytic activity is measured by electro-metric titration of the liberated fatty acids.

H. G. Bray.

4140

DIETRICH, L. S. and BORRIES, E. On the determination of xanthine oxidase activity in animal tissues. *J. Biol. Chem.*, 1954, **208**, 287-292. [Dept. Biochem., Coll. Phys. Surg., Columbia Univ., New York.]

4141

DELCOURT, A. and VAN DER HOEDEN, R. Pseudo-cholinestérase et affections hépatiques: à propos d'une nouvelle technique de détermination. [Pseudocholinesterase and hepatic disease: a new method of estimation.] *Acta*

gastro-enterol. belg., 1954, **17**, 102-109. *Proc. [Serv. Méd. Int., Inst. Méd. Chirurg., Ixelles.]* Dutch, English and Portuguese summaries.

Miscellaneous

4142

VENKATESWARLU, P. and NARAYANA RAO, D. **Investigations on the removal of fluoride from water: rapid removal of fluoride with magnesium oxide.** *Indian J. Med. Res.*, 1953, **41**, 473-477. [Dept. Biochem., Med. Coll., Trivandrum.]

Data are given on the treatment by boiling for 5 min. with light or heavy MgO of water samples containing 5, 10 or 20 p.p.m. F. Removal was most effective with light MgO and was greater than reported by Elvove (Abst. 2889, Vol. 7). The oxide could be re-activated by ignition and used on a number of occasions.—D. Harvey.

4143

VENKATESWARLU, P. and NARAYANA RAO, D. **Investigations on the removal of fluoride from water: factors governing the adsorptions of fluoride by magnesium oxide.** *Indian J. Med. Res.*, 1954, **42**, 135-140. [Dept. Biochem., Med. Coll., Trivandrum.]

In laboratory investigations further to those described in the preceding abstract the possibility was studied of eliminating the need for boiling and so making the method applicable to public water supplies. The effects of temperature and time of treatment and of concentrations of F and MgO were examined and the findings are reported in a series of graphs.

Warming the water to 40° C. with stirring after the addition of an amount of MgO calculated for the F content of the water and subsequent filtration are recommended.—D. Harvey.

4144

BENNETT, A. and HUDSON, J. R. **Study of methods for determination of moisture in malt.** *J. Inst. Brewing*, 1954, **60**, 35-42. [Brewing Indust. Res. Found., Nutfield, Surrey.]

The Institute of Brewing standard water-oven method of estimating moisture in malt (*J. Inst. Brewing*, 1948, **54**, 179) was compared with 3 other methods, drying *in vacuo* at a series of temperatures between 40° and 100° C., titration with Karl Fischer reagent, and distillation with a water-immiscible liquid in a Dean and Stark apparatus. For grinding the malt a special steel mortar was devised. The 4 methods are described in full and results obtained with them are tabulated for 7 samples. Those by the Institute's standard method were always substantially lower than those for the other 3, which were in fair agreement. The causes of the discrepancy were investigated

by the principle of differential thermal analysis, and it was concluded that in the process of oven drying enzymic hydrolysis of the starch or protein constituents of the malt led to some of the water becoming chemically bound. For practical routine purposes the Karl Fischer titration is recommended as quickest and easiest.—E. M. Hume.

4145

ZELENY, L. **Methods for grain moisture measurement.** *Agric. Eng.*, 1954, **35**, 252-256. [Grain Div., Agric. Marketing Serv., U.S. Dept. Agric.]

A critical review.

4146

BENNETT, A. and HUDSON, J. R. **Determination of moisture in cereals: review of methods in common use.** *J. Inst. Brewing*, 1954, **60**, 29-34. [Brewing Indust. Res. Found., Nutfield, Surrey.]

4147

FETZER, W. R. **Some anomalies in the determination of moisture.** *Agric. Eng.*, 1954, **35**, 173-175; 178. [Clinton Foods, Inc., Clinton, Iowa.]

A critical review.

4148

SCIENTIFIC COMMITTEE FOR THE STANDARDIZATION OF METHODS FOR THE ANALYSIS OF MILK AND DAIRY PRODUCTS. **Standardization of methods for the analysis of milk and dairy products in the Netherlands. 6. The determination of the titratable acidity of milk.** *Nederlands Melk Zuiveltijdschr.*, 1953, **7**, 246-250. [Govt. Dairy Stat., Leyden.]

Full details are given of the standardised apparatus, solutions and methods to be used in the Netherlands in estimating the titratable acidity of milk, so that results obtained in different laboratories may be comparable. The Standard Specification is designed for the analysis of whole milk, "standardised liquid milk", partly or completely skimmed milk, buttermilk, acidified partly or completely skimmed milk, and whey. For titration of 10 ml. of the undiluted sample 0.50 ml. of 2 per cent. phenolphthalein in ethanol is used as indicator. The end-point is determined by comparing the colour with a "standard colour" obtained by adding 0.50 ml. of a 0.0005 per cent. solution of "Basic Fuchsin" to 10 ml. of the sample. Titration is with 0.1 N NaOH. As the sample is not diluted, the method cannot be used for very viscous products such as cream or condensed milk; for these a special method will be designed.—M. B. Richards.

4149

SCIENTIFIC COMMITTEE FOR THE STANDARDIZATION OF METHODS FOR THE ANALYSIS OF MILK AND DAIRY PRODUCTS. **Standardization of methods for the analysis of milk and dairy products in the Netherlands. 7. The determination of the density of buttermilk, acidified skimmed milk, and "yogurt milk" at 20° C with a lactodensimeter.** *Nederlands Melk Zuiveltijdschr.*, 1954, 8, 34-36. [Govt. Dairy Stat., Leyden.]

The conditions to be observed in the use of the densimeters previously described (Abst. 3931, Vol. 23) and the pre-treatment which is necessary when estimating the density of the above milk products are outlined in detail.—W. Godden.

4150

KIELANOWSKI, J. and OSIŃSKA, Z. **Metody określenia zawartości tłuszczu i mięsa w tuszach tuczników mięsnych. [Methods for estimating fat and lean content of bacon carcasses.]** *Rocz. Nauk rol.*, 1954, 67, 173-191. [Inst. Zootech.] English and Russian summaries.

The investigation was designed to establish indices for the estimation of lean and fat content of bacon carcasses without detailed dissection. Such indices would be of value to progeny testing stations.

The right sides of 32 carcasses were measured and cut up according to a routine procedure and the prime cuts were dissected into fat, lean, bone and skin. Simple and multiple correlations were computed between different measurements and weights on the one hand and the total yield of meat and fat of the prime cuts on the other.

A highly significant correlation ($r = +0.606$) was found between the lean content of the prime cuts and the width of the eye of loin, but the correlation between lean content and the depth of eye was low and not significant ($r = +0.203$).

Fat thickness measured at the cranial margin of the section of the gluteus muscle showed the highest and highly significant correlation ($r = +0.841$) with the fat content of the prime cuts; lower, but still significant, correlations were shown by the other rump measurements ($r = +0.766$ and $+0.767$) as well as by the shoulder measurement ($r = +0.723$) and the loin fat measurement ($r = +0.627$). (From English summary.)—W. Godden.

4151

PRICE, S. A. and BOUCHER, K. A. **The assay of penicillin in compound feeding stuffs.** *Analyst*, 1954, 79, 150-158. [Walton Oaks Exp. Stat., Vitamins, Ltd., Dorking Rd., Tadworth, Surrey.]

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A large-plate method with *Bacillus subtilis* as test organism is described. Samples of feeding-stuff are extracted with methanol and the extracts are taken up on paper discs which are applied to the medium.—H. G. Bray.

4152

ANDERSON, D. G. and VENNESLAND, B. **The occurrence of di- and triphosphopyridine nucleotides in green leaves.** *J. Biol. Chem.*, 1954, 207, 613-620. [Dept. Biochem., Univ. Chicago, Ill.]

The method employed for preparation of concentrated extracts of the nucleotides was a combination and modification of the methods of Fiegelson *et al.* (Title 3126, Vol. 20) and of LePage (*J. Biol. Chem.*, 1947, 168, 623; 1949, 180, 975). The final estimation of diphosphopyridine nucleotide was by measurement of the increase in light absorption at 340 m μ . in the presence of alcohol and yeast alcohol dehydrogenase, and of triphosphopyridine nucleotide similarly in the presence of glucose-6-phosphate and glucose-6-phosphate dehydrogenase. Both nucleotides were found in the green leaves of bean, maize, tomato, parsley, pea and spinach plants in approximately equal amounts varying from 2.6 to 13.7 μ g. per g. fresh material according to the species.—W. Godden.

4153

GRUSZCZYŃSKI, T. and KMIECIK, J. **Badanie krajowych konserw z owoców pestkowych na zawartość cyjanowodoru. [Estimation of the hydrocyanic acid content of locally produced canned kernel fruits.]** *Rocz. Państwowego Zakł. Hig.*, 1954, 5, 109-114. [Stac. San.-Epid., Kielcach.] Russian and English summaries.

Hydrocyanic acid was estimated in stewed stone fruits locally grown. Only traces of free HCN were occasionally found. The quantity of total HCN, free and combined, found never exceeded 0.5 mg. per 100 g. stewed fruit. (From summary.) W. Godden.

4154

FEULGEN, R., BOGUTH, W., SEYDL, G. and ANDRESEN, G. **Der "Plasmalogentest" und der "Farbquotient der Acetalphosphatide" im Blutserum. [The "plasmalogen" test and the "colour quotient of acetal phosphatides" in blood serum.]** *Hoppe-Seyler's Ztschr.*, 1953, 295, 271-277. [Physiol. Chem. Inst., Justus-Liebig-Hochsch., Giessen.]

A simpler method of estimating plasmalogen (see Abst. 3065, Vol. 21), for use on a macro- or micro-scale, is described; it takes about 1 hr. and is claimed to be accurate to ± 2.5 per cent.

Values are given for man and domestic animals. They appear to be characteristic of the species; in cattle they rise with age.—W. M. Deans.

4155

THALER, H. and SOMMER, G. Studien zur Farbstoffanalytik. 5. Nachweis und Identifizierung wasserlöslicher Teerfarbstoffe in Lebensmitteln. [Studies in pigment analysis. 5. Demonstration and identification of water-soluble aniline dyes in foods.] *Ztschr. Lebensmittel-Untersuch. Forsch.*, 1953, **97**, 441-446. [Deutsch. Forschungsanst. Lebensmittelchem., Munich.]

In the demonstration and identification of water-soluble aniline dyes in foods by paper chromatography, considerable interference is caused by proteins, carbohydrates, minerals and other substances which go into solution along with the dyes. A highly specific method of isolating the aniline dyes consists in absorbing them on wool, from which they are readily extracted again in a state of purity by dilute ammonia, this ammoniacal solution being then used for the chromatographic identification. Instructions are given for the application of the method to a series of foodstuffs of different kinds, those with a starch or gelatine basis, and those containing much sugar or fat.

M. B. Richards.

MICROBIOLOGICAL

4156

MERTZ, E. T., RENNERT, S. S. and COLE, E. W. Bacterial method for determining digestibility of food and feed proteins. *Federation Proc.*, 1954, **13**, 264. [Dept. Biochem., Purdue Univ., Lafayette, Ind.]

4157

TUNG SUN, J. Y. and SUN, Y. P. Microbioassay of insecticides in milk by a feeding method. *J. Econ. Entomol.*, 1953, **46**, 927-930. [Shell Development Co., Denver, Colo.]

See also Abst. 5017.

CLINICAL AND EXPERIMENTAL

4158

MORELAND, F. B. and GURGIOLO, A. E. Measurement of basal metabolic rate from the urinary pigment/creatinine ratio. *Federation Proc.*, 1954, **13**, 439. [Dept. Biochem., Baylor Univ. Coll. Med., Houston, Tex.]

gastrointestinal tract. *Proc. Staff Meetings Mayo Clin.*, 1954, **29**, 235-240. [Sect. Physiol.]

Results of 31 experiments on 7 men and 7 women indicate that the rate of appearance of D₂O in arterial (but not in venous) blood can be used to study absorption of water from the digestive tract.—D. Duncan.

4159

WHITTLESEY, P. A continuous intravenous infusion apparatus for the unanesthetized dog. *J. Lab. Clin. Med.*, 1954, **43**, 324-326. [Dept. Pharmacol., Johns Hopkins Univ., Baltimore, Md.]

The essential part of the apparatus is a self-aligning ball-bearing flanged cartridge, attached to the top panel of a metabolism cage, and fitted with a sleeve through which passes a 36-in. armoured cable. The opposite end of the cable is clamped to a reversible connector anchored to the collar of the dog, which is held in position by a harness. Within the cable runs a length of Tygon tubing, ending in a spinal needle cut off square 2 in. from the hub and shaped to conform with the circular collar on the animal. To this needle is attached a length of polythene tubing and finally the needle for insertion into the jugular vein.—W. A. Greig.

4161

KIMBEL, K. H. and KINZLMEIER, H. Quantitative intragastrale Bestimmung der Säureproduktion des gesunden und kranken Magens. [Quantitative intragastric estimation of acid production in the healthy and disordered stomach.] *Gastroenterologia*, 1954, **81**, 193-206. [Klin. Med., Univ. Erlangen.] English and French summaries.

4162

BOLT, R. J., POLLARD, H. M. and CARBALLO, A. Determination of gastric secretory function by measurement of substances excreted by the kidneys. 1. Uropepsin excretion in health and disease.

POLLARD, H. M., CARBALLO, A. and BOLT, R. J. 2. An evaluation of the tubeless method of gastric analysis. *J. Lab. Clin. Med.*, 1954, **43**, 335-339; 340-346. [Dept. Int. Med., Univ. Hosp., Med. Sch., Univ. Michigan, Ann Arbor.]

4160

CODE, C. F., SCHOLER, J. F., HIGHTOWER, N. C., DIETZLER, F. K. and BALDES, E. J. Absorption of water from the upper part of the human

1. A critical study of the diagnostic use of urinary pepsinogen estimations is presented. The concentration of urinary pepsinogen is only slightly higher in patients with duodenal ulcer than in normal persons, but the rate of excretion is twice as great. There is a wide variation in the rates of excretion of pepsinogen in each of various conditions.

2. The quininium test is reliable in the detection of gastric achlorhydria and qualitatively reliable for the estimation of free gastric acid. It is suggested that the test may be of value in screening patients for achlorhydria, but it is of limited use in differential diagnosis.—H. G. Bray.

4163

PREIBISCH, W. Eine Pankreasfunktionsprüfung mit vereinfachter Fermentbestimmung. [Test of pancreatic function by a simplified method of enzyme estimation.] *Gastroenterologia*, 1954, **81**, 206-225. [2. Klin. Med., Univ. Vienna.] English and French summaries.

4164

TOMPKINS, E. H. Measurement of erythrocytic diameters with phase microscopy. *J. Lab. Clin. Med.*, 1954, **43**, 212-214. [Cancer Res. Inst., New England Deaconess Hosp., Boston, Mass.]

4165

KRAININ, M. J., WHITNER, V. S. and MERRILL, A. J. A simple indirect method for determining plasma sodium levels. *J. Lab. Clin. Med.*, 1954, **43**, 482-488. [Dept. Med., Emory Univ. Sch. Med., Atlanta, Ga.]

Haematocrit values are measured on blood as collected (H_0) and after replacing part of the plasma by two different solutions of NaCl and KCl (H_1 and H_2). A calibration curve giving the relationship between the quantity $(H_0 - H_1)/(H_2 - H_1)$ and the plasma sodium level is used.

H. G. Bray.

4166

REILLY, W. A., FRENCH, R. M., LAU, F. Y. K., SCOTT, K. G. and WHITE, W. E. Whole blood volume determined by radiochromium-tagged red cells. Comparative studies on normal and congestive heart failure patients. *Circulation*, 1954, **9**, 571-580. [Radioisotope Unit, Ft. Miley Veterans Admin. Hosp., San Francisco, Calif.] Spanish summary.

A sample of whole blood is labelled with $\text{Na}_2^{51}\text{CrO}_4$ under conditions which are described and the red cells are isolated and suspended in saline for re-injection. Blood samples are taken from 30 min. to 1 hr. later, their radio-activity is measured and the blood volume is calculated.

H. G. Bray.

4167

PLENTL, A. A. and GELFAND, M. M. A modification of the dye-dilution method for serial estimations of plasma volume. *Surg. Gynecol. Obstet.*, 1954, **98**, 485-493. [Dept. Obstet. Gynaecol., Coll. Phys. Surg., Columbia Univ., New York.]

A more accurate method of administering the dye is described; 3 to 4 mg. may be used instead of the usual 15 to 20 mg. It is concluded that the measurement of the ratios of optical densities is not a reliable measure of the amounts of dye in plasma. Evans Blue does not appear to be phagocytised by the reticulo-endothelial system in man as it is in the cat.—H. G. Bray.

4168

ADAMS, J. Q. Cardiovascular physiology in normal pregnancy: studies with the dye dilution technique. *Amer. J. Obstet. Gynecol.*, 1954, **67**, 741-759. *Proc.* [Div. Obstet. Gynaecol., Univ. Tennessee Coll. Med., Memphis.]

4169

LORING, W. E. A rapid, simplified method for serial blood volume determinations in the rat. *Proc. Soc. Exp. Biol. Med.*, 1954, **85**, 350-351. [Dept. Pathol., Sch. Med., Yale Univ.]

A modified Evans Blue method is described.

H. G. Bray.

4170

FREINKEL, N., SCHREINER, G. E., ATHENS, J. W., HIATT, C. W. and BREESE, S. Artifactual differences in the distribution of T-1824 and I^{131} -labelled albumin resulting from mixing prior to administration. *J. Lab. Clin. Med.*, 1954, **43**, 215-226. [Dept. Biophys., Army Med. Serv. Grad. Sch., Walter Reed Army Med. Centre, Washington, D.C.]

4171

FIELDS, T., KAPLAN, E. and TERRIL, M. A simplified technique for blood volume determinations using I^{131} HSA. *J. Lab. Clin. Med.*, 1954, **43**, 332-334. [Radioisotope Unit, Veterans Admin. Hosp., Hines, Ill.]

4172

HIX, E. L. Simultaneous determination of extra-cellular and total body water in ruminants using sodium thiocyanate and antipyrine and its value in nutrition studies. *J. Animal Sci.*, 1953, **12**, 948. *Proc.* [Kansas State Coll.]

4173

LINNÉR, E. A method for determination of time-concentration curves using one single sample and several test substances. *Acta Soc. Med.*

upsalien., 1954, **59**, 241-242. [Pharmacol. Inst., Univ. Upsala.]

Several test substances, preferably isotopic, are injected at different times, with suitable intervals, into a body fluid. Their concentrations are estimated in one and the same sample of the fluid drawn after a suitable lapse of time. This gives several points on a time-concentration curve from the analysis of only one sample, and can be used to measure, *e.g.*, rate of flow of a body fluid, such as aqueous humour, when a succession of samples cannot be taken.—W. Godden.

4174

HORN, M. J., BLUM, A. E. and WOMACK, M. **Availability of amino acids to microorganisms. 2. A rapid microbial method of determining protein value.** *J. Nutrition*, 1954, **52**, 375-381. [Bur. Human Nutrit., Agric. Res. Admin., U.S. Dept. Agric., Washington, D.C.]

To a basal medium containing no amino-acid 3 preparations of cottonseed meal were added at 5 levels of protein and the resulting growth of a strain of *Leuconostoc mesenteroides* was measured. The preparations were an enzymic digest of the processed meal at pH 6.8, an enzymic digest of unprocessed meal at pH 6.8 and an acid digest of unprocessed meal filtered at pH 4.0, supplemented with tryptophan in the amount found in cottonseed meal and adjusted to pH 6.8. The ratio of the protein efficiency of a processed to that of an unprocessed meal was expressed as a percentage. Two series of cottonseed meals were thus investigated and the protein efficiency percentage values were compared with those obtained in rat-feeding experiments. With one exception the indices of protein efficiency obtained by the methods followed the same order. The method can be extended to other types of foodstuff.—M. J. Dobson.

4175

FEINSTEIN, A. R., BETHARD, W. F. and MCCARTHY, J. D. **A new method, using radioiron, for determining the iron-binding capacity of human serum.** *J. Lab. Clin. Med.*, 1953, **42**, 907-914. [Dept. Med., Univ. Chicago, Ill.]

Radio-active Fe, in reduced form, of known specific activity is added to serum in amount greater than that required to saturate the protein. The mixture is allowed to stand 15 min. at room temperature; the Fe-saturated protein is precipitated with neutral saturated ammonium sulphate and separated by filtration and centrifuging. The excess of unbound radio-active Fe is measured; from this value and the original activity of the solution the amount of Fe bound is calculated. The method gives results in agreement with those obtained by spectrophotometric methods but has

the advantage of greater accuracy. It is applicable to a wider range of types of sera, *e.g.*, jaundiced serum and serum which is older than 24 hr.

W. Godden.

4176

McDOWELL, R. E., LEE, D. H. K. and FOHRMAN, M. H. **The measurement of water evaporation from limited areas of a normal body surface.** *J. Animal Sci.*, 1954, **13**, 405-416. [Bur. Dairy Indust., Agric. Res. Centre, Beltsville, Md.]

An apparatus is described and illustrated for measuring the rate of water evaporation from selected rectangular areas, 10 sq. cm., of skin without greatly altering the humidity of the air to which they are exposed. A capsule is attached to the skin and the absorber tubes contain a saturated solution of a salt of the desired vapour pressure. In the closed circuit is a diaphragm pump and a rotometer to measure the rate of air flow. When measurements are not being made a similar maintenance equipment which can serve 3 or 4 capsules simultaneously is used. Evaporation from the skin is measured by gain in weight of the absorber.

Preliminary experiments with one cow showed that at 100° F. ambient temperature and 29 mm. Hg vapour pressure the rate of evaporation varied for different parts of the body, being lowest on loin and neck and highest on paunch and withers. It increased at all points with rise in temperature, the increase being relatively greater for those areas with lower values at the lower temperature. No significant difference was found between Jersey and Jersey Sindhi cows for areas on the forechest and paunch under the same conditions. At 105° F. and 34 mm. Hg vapour pressure rates of evaporation for these areas reached 660 g. per sq. m. per hr. With the same technique under the same hot condition rabbits showed little or no evaporation.—W. Godden.

4177

McDOWELL, R. E., LEE, D. H. K. and FOHRMAN, M. H. **Measurement of water evaporation from selected areas of hide in domestic animals.** *J. Animal Sci.*, 1953, **12**, 949. *Proc.* [U.S. Dept. Agric.]

4178

SARGENT, F. II. **Chronic dehydration as source of error in estimating body fat by skinfold thickness method.** *Federation Proc.*, 1954, **13**, 126. [Dept. Physiol., Univ. Illinois, Urbana.]

4179

BEHNKE, A. R. **Estimation of lean body weight (LBW) from anthropometric measurements.** *Federation Proc.*, 1954, **13**, 519. [U.S. Naval Radiol. Defense Lab., San Francisco, Calif.]

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- 4180
TANNER, J. M. **Some notes on the reporting of growth data.** *Human Biol.*, 1951, **23**, 93-159. [Sherrington Sch. Physiol., St. Thomas's Hosp. Med. Sch., London.]
- 4181
ARNOLD, J. S. and JEE, W. S. S. **Preparing bone sections for radioautography.** *Stain Technol.*, 1954, **29**, 49-54. [Radiobiol. Lab., Coll. Med., Univ. Utah, Salt Lake City.]
- 4182
ARNOLD, J. S., TAYSUM, D. H. and JEE, W. S. S. **Apparatus for bone sectioning.** *Stain Technol.*, 1954, **29**, 55-58. [Radiobiol. Lab., Coll. Med., Univ. Utah, Salt Lake City.]
- 4183
LATHROP, K. A. and HARPER, P. V. **Long-term recovery of metabolic products from rats.** *Science*, 1954, **119**, 447-448. [Div. Biol. Med. Res., Argonne Nat. Lab., Lemont, Ill.]
A method is described which involves immobilisation of the rat in a plaster cast. Respiratory gases and unmixed excreta uncontaminated with food were collected continuously for 3 weeks, and this time might be increased.—D. Duncan.
- 4184
HELLMAN, B. and DIDERHOLM, H. **An improved metabolic cage for small animals.** *Acta Soc. Med. upsalien*, 1954, **59**, 243-249. [Dept. Histol., Univ. Upsala.]
Detailed instructions, along with 2 figures, describe the construction of the cage, which is an inverted 15-litre glass bottle with the bottom cut off and replaced by a close-fitting plexiglass disc. The separation of urine and faeces is brought about with the minimum risk of mixing. There is a simple arrangement for maintaining constant air humidity and proper ventilation.—W. Godden.
- 4185
KAWAMURA, Y. and FUNAKOSHI, M. [Studies on the mechanism of needs. 1. A simple method to record the drinking behaviors of rats.] *Osaka Daigaku Igaku Zasshi*, 1953, **6**, 95-96. [Dept. Oral Physiol., Dent. Sch., Univ. Osaka.] In Japanese: English summary.
The drinking flask was hung on a spring, the contraction of which was recorded by a kymograph. E. M. Hume.
- 4186
ASHTON, G. C., CATRON, D. V., HOMEYER, P. G., CURRY, N. H. and CULBERTSON, C. C. **Portable units for individual experimental pig feeding pasture.** *J. Animal Sci.*, 1953, **12**, 937-938. *Proc.* [Iowa State Coll.]
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- 4187
HORN, L. H. (Jr.), RAY, M. L. and NEUMANN, A. L. **Digestion and nutrient-balance stalls for steers.** *J. Animal Sci.*, 1954, **13**, 20-24. [Dept. Animal Sci., Coll. Agric., Univ. Illinois.]
These stalls are similar to those constructed for wethers by Briggs and Gallup (Abst. 4454, Vol. 19) and for pigs by Hansard *et al.* (Abst. 147, Vol. 21). The steer is restrained by a chain at the rear of the stall; forward movement is prevented by adjustment of the position of the feed box. Urine is collected through a rubber funnel leading to a bottle beneath the stall.—D. M. Walker.
- 4188
NELSON, A. B., TILLMAN, A. D., GALLUP, W. D. and MACVICAR, R. **A modified metabolism stall for steers.** *J. Animal Sci.*, 1954, **13**, 504-510. [Dept. Animal Husb., Oklahoma Agric. Exp. Stat., Stillwater.]
A metabolism stall built mostly of welded pipe and angle iron is described with working diagrams. It has the following modifications of the usual type of stall: (1) all-metal construction except for the floor, (2) provision for ready adjustment of the length of the stall so that the faeces drop clear of the floor at the rear, (3) use of sliding dairy-type stanchions, (4) automatic water device, (5) clearance of 26 in. between the floor and the base of the stall, and (6) provision for collection of urine by metal grid and funnel or by rubber funnel and hose.—D. M. Walker.
- 4189
DICK, A. T. and MULES, M. W. **Equipment for the clean collection of twenty-four-hour samples of urine and faeces from sheep.** *Austral. J. Agric. Res.*, 1954, **5**, 345-347. [Div. Animal Health Prod., C.S.I.R.O., Animal Health Res. Lab., Parkville, Victoria.]
Attempts were made to modify the cage designed by Marston (Abst. 1084, Vol. 5) for use in work on trace elements so as to avoid contamination of urine with faeces and vice versa. These were not successful and the work as described elsewhere (Abst. 4745, Vol. 23) was done with wether sheep with a harness carrying a moulded elliptical rubber bag fitted on a stainless steel rim and with a tube leading the urine away to a collecting vessel. Screens and bins for collecting the faeces were all made of stainless steel.—W. Godden.
- 4190
HANSARD, S. L. and COMAR, C. L. **Measurement of true digestibility of calcium in feeds for cattle.** *J. Animal Sci.*, 1953, **12**, 919. *Proc.* [Tennessee Agric. Exp. Stat.]

4191

SCHÜRCH, A. Die Verdauungskoeffizienten: Bestimmung, Berechnung und Signifikanz. [Coefficients of digestibility: estimation, computation and significance.] *Kraftfutter*, 1953, No. 2. English summary.

The importance of an accurate knowledge of the digestibility coefficients of the nutrients in a feed or ration for its proper evaluation is stressed. Methods of estimating or computing such coefficients are briefly reviewed. A formula is given for calculating digestibility coefficients by difference:

$$Y = 100 \frac{(T \pm G) - (X \pm G)}{y} + (X \pm G),$$

where X is the digestibility of the basal feed, Y that of the supplement, T that of the basal feed plus supplement, y the percentage of the supplement in the total ration and G the standard deviation inherent in such experiments. The use of radio-active isotopes in the estimation of true digestibility values is briefly discussed.

W. Godden.

4192

CREMER, H. D. and LINGEN, H. Über die Verwendung von Chromtrioxyd (Cr_2O_3) als unverdauliche Testsubstanz. [The use of chromium trioxide (Cr_2O_3) as indigestible test substance.] *Hoppe-Seyler's Ztschr.*, 1953, 295, 10-14. [Physiol. Chem. Inst., Johannes-Gutenberg-Univ., Mainz.]

Cr_2O_3 was found to be a satisfactory test substance in digestibility trials with rats.

The digestion of mutton fat by rats was increased from just under 87 to just under 89 per cent. by addition of dilute alcohol, and to 90 per cent. by addition of wine to a ration of mutton fat 20, casein 10, enriched wheat 68 and salts 2 per cent. with vitamins A and D. Neither wine nor alcohol affected the digestion of the protein in the ration.—W. Godden.

4193

GREKOWICZ, M. and BARTNIK, J. Zastosowanie tzw. "metody wskaźnikowej" do oznaczeń strawności (przy użyciu Cr_2O_3 jako wskaźnika.) [Adaptation of an "indicator" method for the study of digestibility (with chromium oxide as indicator).] *Rocz. Państwowego Zakł. Hig.*, 1954, 5, 15-23. [Z Działu Hig. Żywnienia PZH.] Russian and English summaries.

Digestibility trials were made with rats; the foods tested were legume seeds and whole grain flours. Cr_2O_3 was estimated colorimetrically in food and faeces, after oxidation with Na_2O_2 to Na_2CrO_4 . Good agreement was obtained between the results when the Cr_2O_3 was mixed with the dry and with the wet food if proper homogenisation was attained. (From summary.)—W. Godden.

4194

LANCASTER, R. J. and BARTRUM, M. P. Measurement of feed intake by grazing cattle and sheep. 4. A source of error in the chromogen technique of estimating the digestibility of fodders. *N.Z. J. Sci. Technol.*[A], 1954, 35, 489-496. [Animal Res. Div., Dept. Agric., Ruakura Animal Res. Stat., Hamilton.]

For previous parts see Absts. 133, Vol. 21; 2679, Vol. 23; 2452, Vol. 24.

The stability of chromogen solutions prepared by extracting fresh faeces with 85 per cent. acetone in the dark was examined by measurement of the optical density at 406 $\text{m}\mu$. The optical density increased rapidly on exposure to light, the rate of increase being a function of light intensity and time. It is recommended that readings be made within 6 hr. of the preparation of the extract, since the optical density of extracts kept in the dark remains constant for that length of time; it increases by 20 to 30 per cent. over the next 10 days. Pasture chromogen solutions kept in the dark at room temperature did not change in optical density over long periods (1 year).

D. M. Walker.

4195

DAVIDSON, J. The chromogen method for determining the digestibility of dried grass by sheep. *J. Sci. Food Agric.*, 1954, 5, 209-212. [Rowett Res. Inst., Bucksburn, Aberdeenshire.]

Four sheep were used in an experiment to compare the digestibility of dried grass when estimated by the standard total collection method and by the ratio method that uses as index the plant chromatogens extracted from the food and faeces by 85 per cent. acetone and estimated from their light absorption at wavelength 406 $\text{m}\mu$.

Digestibility values obtained by the chromogen method were low when extracts were read at 406 $\text{m}\mu$. and agreed more nearly with the total collection method when read at 416 $\text{m}\mu$. It was concluded that for general use the chromogen method was applicable only when comparative trials had shown general agreement with the other method.

The losses of pigment in their passage through the alimentary tract were measured and shown to vary from 18 per cent. for the carotenoids to 62 per cent. for the total fat-soluble tetrapyrroles and 87 per cent. for chlorophylls. These values varied from sheep to sheep.—D. M. Walker.

4196

TAYLOR, W. B. and ARMSTRONG, P. J. The efficiency of some experimental designs used in dairy husbandry experiments. *J. Agric. Sci.*, 1953, 43, 407-412. [Appl. Mathematics Lab., D.S.I.R., New Zealand.]

N.A. and R., October 1954

A study is made of the relative efficiencies in dairy husbandry experiments of different experimental designs of the reversal, Latin square, and incomplete Latin square types. From a mixed cow herd, representative of good New Zealand grade herds, 48 complete lactation records for uniformity trials of these types were obtained. Data from the 40th to the 200th day after calving were used, split up into 3- or 5-week periods, separated by intervals of a week, which would be necessary in practice to allow for residual effects. Measurements analysed were milk yield, fat yield, solids-not-fat, and fat percentage.

The types of experiment considered are those in which 2, 3 or 4 treatments have to be compared, and in which data are collected in 3 or 4 consecutive periods. The relative efficiencies of the different designs are shown as the ratios of the variances of treatment comparisons taken two at a time. It was found (1) that experiments conducted during the earlier part of the lactation are more efficient than those during the later part, (2) that early experiments with 3-week periods are more efficient than experiments with 5-week periods, (3) that an extension from 3 to 4 periods reduces error in the case of 3-week periods but not of 5-week periods, since four 5-week periods carry the experiments into the more variable part of the lactation, and (4) that little benefit is obtained by grouping the animals according to yields recorded during the first 40 days of lactation.

Results of comparisons between reversal and Latin square experiments are different in different cases, and possible reasons for this are discussed.

Results are not quoted for comparisons between the designs above and ordinary group trials, but it is stated that these confirm the acknowledged superiority of the more elaborate designs.

I. McDonald.

4197

IVINS, J. D. **The measurement of pasture output on the dairy farm.** *J. Brit. Grassland Soc.*, 1953, **8**, 337-344. [Sch. Agric., Univ. Nottingham.]

A study was made of the method of gauging pasture output by calculation of the starch equivalent utilised by grazing dairy herds. This method of measuring pasture output on a farm scale is the one on which most emphasis is placed in Great Britain at the present time. Its main disadvantage is that it is a measurement of the amount utilised by the grazing animals rather than of the amount available, and so different results would be obtained for the same pasture grazed by different herds. The object of the study was to discover which characteristics of the animals were important in this respect. From the examination of detailed records from 382 dairy cows it was found that the most important variant was time of calving in relation to time of

peak pasture output. Tentative correction factors are put forward to enable results to be adjusted to the values that would have been obtained from a grazing herd of standard composition with respect to times of calving. It is suggested that these corrected values of utilised starch equivalent would provide better measures of pasture output than do the crude values.—I. McDonald.

4198

SMART, W. W. G. (Jr.) **Possibilities of using sodium copper chlorophyllins as an indicator in forage studies.** *J. Animal Sci.*, 1953, **12**, 941. *Proc.* [N. Carolina Agric. Exp. Stat.]

4199

McCULLOUGH, M. E. and SELL, O. E. **Some correlations between pasture quality and animal performance in relation to some limiting factors in pasture evaluation.** *J. Animal Sci.*, 1953, **12**, 941. *Proc.* [Georgia Exp. Stat.]

4200

BENNETT, E. and ARCHIBALD, J. G. **A simple test of quality in hay.** *J. Dairy Sci.*, 1954, **37**, 552-555. [Dept. Chem., Massachusetts Agric. Exp. Stat., Amherst.]

Three g. dry hay ground to pass a 0.5 mm. sieve are suspended in 200 ml. water containing 4 or 5 drops of acetic acid. The mixture is agitated for 5 min. in a blender, made up to 500 ml. and centrifuged at 1500 r.p.m. for 5 min. The supernatant liquid is poured through a thin layer of glass wool and the optical density of the filtrate is measured in a spectrophotometer at 675 m μ . with a PC-5 Corning filter, and distilled water as reference liquid. Tests with 10 samples of hay and 6 of oven-dried fresh grasses or legumes showed highly significant correlations between optical density and crude protein, $r = +0.86$; optical density and crude fibre, $r = -0.82$; and optical density and protein:fibre ratio, $r = -0.81$. A preliminary test in 2 seasons with 3 cows in each showed a decline in milk production when the cows were transferred from "good" to "poor" hay and vice versa.—W. Godden.

4201

CROWN, R. M. **A preliminary study of carcass quality data from the 12th ribs of beef as compared to that of the 9-10-11 rib cuts.** *J. Animal Sci.*, 1953, **12**, 901. *Proc.* [Louisiana State Univ.]

4202

NAUMANN, H. D., BRADY, D. E. and DYER, A. J. **Methods of evaluating quality in beef.** *J. Animal Sci.*, 1953, **12**, 903. *Proc.* [Univ. Missouri.]

4203

- GREEN, W. W. Further studies on the estimation of carcass yields in beef animals. *J. Animal Sci.*, 1953, **12**, 894. *Proc.* [Univ. Maryland.]

4204

- WHITEMAN, J. V., WHATLEY, J. A. and HILLIER, J. C. A further investigation of specific gravity as a measure of pork carcass value. *J. Animal Sci.*, 1953, **12**, 859-869. [Dept. Animal Husb., Oklahoma Agric. Exp. Stat.]

There was a multiple correlation coefficient of 0.912 between the sp. gr. of the lean of hams and the percentages of moisture, protein and ether extract. The correlation might have been even higher had it not been for errors in the sampling of the meat before chemical analysis. A subsidiary trial showed that 8 per cent. of the total variation in moisture content between hams and 11.3 per cent. of the variation in ether extract were due to the errors in sampling.

There was a high correlation between the sp. gr. of hams and the half carcasses from which they came, which suggested that the proportions of the tissues in the ham are indicative of the proportions of these tissues in the entire carcass.

Correlations between the sp. gr. of the hams and the percentages of the various components of the ham were calculated; percentage lean and percentage fat were much more closely associated

with the sp. gr. than was the percentage bone. Correlations between the sp. gr. of the half carcasses and the percentage bone were positive and significant, but were very much reduced when percentages of lean cuts were held constant by partial correlation.

Simple intra-breed correlations were calculated between 8 measures of carcass leanness and sp. gr. and also between the 8 measures and average backfat thickness. For one set of data sp. gr. was significantly more highly correlated with the 8 measures than was average backfat thickness, but although the same trend was evident in a second set of data the differences between correlation coefficients was not statistically significant.

A discussion of some points in the use of the sp. gr. technique is also included.—I. A. M. Lucas.

4205

- BEHNKE, A. R. Formulas for estimation of fat and storage substances in mammals. *Federation Proc.*, 1954, **13**, 10. [Radiol. Defense Lab., San Francisco, Calif.]

4206

- HAZEL, L. N. and KLINE, E. A. Accuracy of eight sites for probing live pigs to measure fatness and leanness. *J. Animal Sci.*, 1953, **12**, 894-895. *Proc.* [Iowa State Coll.]

See also Absts. 4110, 4627, 4318-20, 4392, 5610.

COOKING, STERILISATION AND PRESERVATION OF FOOD

4207

- HANNAN, R. S. The preservation of food with ionizing radiations. *Food Sci. Abst.*, 1954, **26**, 121-126. [Low Temp. Res. Stat., Cambridge.]

4208

- HANSON, H. L. Recent developments in pre-cooked frozen foods. *J. Amer. Dietetic Assoc.*, 1954, **30**, 241-244. [W. Reg. Res. Lab., U.S. Dept. Agric., Albany, Calif.]

4209

- MRAK, E. M. New developments in food processing. *J. Amer. Dietetic Assoc.*, 1954, **30**, 236-240. [Dept. Food Technol., Univ. California, Davis.]

4210

- HALL, D. W. and HYDE, M. B. The modern method of hermetic storage. *Trop. Agric., Trinidad*, 1954, **31**, 149-160. [D.S.I.R., Pest Infestation Lab., Slough, Bucks.]

4211

- RICHARDSON, L. R. and HALICK, J. V. Physical condition, moisture content and growth of molds as factors in the spoilage of animal feeds.

J. Animal Sci., 1953, **12**, 929-930. *Proc.* [Texas Agric. Exp. Stat.]

4212

- MUSCO, D. D. and CRUESS, W. V. Food rancidity. Studies on deterioration of walnut meats. *J. Agric. Food Chem.*, 1954, **2**, 520-523. [Dept. Food Technol., Univ. California, Berkeley.]

4213

- MOSSEL, D. A. A. Het toevoegen aan levensmiddelen van chemische verbindingen zonder voedingswaarde. [The addition to foods of chemical substances without food value.] *T.N.O.-Nieuws*, 1953, **8**, 268-274.

See Title 1378, Vol. 23.

4214

- FAGERSON, I. S. Possible relationship between the ionic species of glutamate and flavor. *J. Agric. Food Chem.*, 1954, **2**, 474-476. [Dept. Food Technol., Univ. Massachusetts, Amherst.]

4215

- BAKER, G. A., AMERINE, M. A. and ROESSLER, E. B. Errors of the second kind in organoleptic

difference testing. *Food Res.*, 1954, **19**, 206-210. [Univ. California, Davis.]

4216

SCHORMÜLLER, J. and KREMPIEN, J. Über den Einfluss der Glucose auf den Threonin-, Serin- und Stickstoffgehalt des Caseins beim Erhitzen. [Effect of glucose on the threonine, serine and nitrogen content of heated casein.] *Ztschr. Lebensmittel-Untersuch. Forsch.*, 1954, **98**, 1-18. [Inst. Lebensmittelchem., Tech. Univ., Berlin-Charlottenburg.]

The literature is reviewed. Threonine and serine were estimated by periodate oxidation (Abst. 3812, Vol. 16). The casein used contained N 15.15, water 8.27, serine 5.95 and threonine 4.15 per cent. Samples of casein alone or with equal parts of glucose were heated in air to temperatures between 100° and 200° C. The results are shown graphically.

Heated to 200° C., the mixture lost twice as much water as casein alone, and browning began as low as 120° C. Casein alone lost little N; threonine and serine began to fall rapidly at about 170° C. and at 200° C. only about 20 per cent. remained. The mixture began to lose N, threonine and serine at about 120° C. but the end results for threonine and serine were much the same. Prolonged heating of casein at 160° C. did not affect threonine, but serine fell during the first 30 min., thereafter more slowly; at 200° C. both fell rapidly at first and then more slowly [text, p. 9; not in agreement with fig. 4]. In presence of glucose, N, threonine and serine all fell rapidly at first; at 200° C. the reaction was almost complete in 30 min., at 160° C. in 90 min.

Heating in nitrogen instead of air reduced the losses. Heating with olive oil to simulate the use of fat in cooking speeded up the loss of threonine and serine from casein alone, but did not greatly affect the mixture. Unlike egg protein (Schormüller and Walter, *Ztschr. anal. Chem.*, 1951, **134**, 337) casein refluxed with water or 5 per cent. glucose did not lose N, threonine or serine, though with glucose there was browning. Storage with or without glucose for 2 months at 37° C. was also without effect.

Ultraviolet absorption curves of hydrolysates of treated samples showed increased absorption and a progressive flattening at higher temperatures of the minimum and maximum characteristic of casein; with glucose the effect set in at a lower temperature. It is considered that the position and shape of the absorption curve can be taken as a measure of the damage.—W. M. Deans.

4217

ROSE, D. and TESSIER, H. Effect of freezing rate on stability of frozen milk. *Canad. J. Technol.*,

Vol. 24, No. 4

1954, **32**, 85-90. [Div. Appl. Biol., Nat. Res. Labs., Ottawa.]

Samples of milk, whole or concentrated, were stored at -12° C. after being frozen at different temperatures. The least stable were those treated at the very low temperature -196° C.; those frozen at -7° C. had the longest storage life. Freezing rate was varied by initiating ice formation at -12° C., continuing at -3° C. for 24 or 48 hr. and completing it at -12° C. Both treatments increased storage life. When the final storage temperature was -18° C. results were not so consistent. Slow freezing, it is concluded, will be advantageous in marketing conditions where the storage period is short and where temperatures, e.g., in display cabinets, are about -12° C. (+10° F.).—D. Harvey.

4218

GIBSON, D. L. and RAITHEY, J. W. Studies on improving the ease of reconstitution of skim milk powder. *Canad. J. Technol.*, 1954, **32**, 60-67. [Dept. Dairy Sci., Univ. Saskatchewan, Saskatoon.]

4219

CROSSLEY, E. L. Heat treatment of milk within the bottle. *Roy. Sanit. Inst. J.*, 1954, **74**, 307-314 (with discussion 314-316). [Dept. Dairying, Univ. Reading.]

A lecture report.

4220

TOLLENAAR, F. D. and MOSSEL, D. A. A. The use of chemicals in dairy products. *XIIIth Internat. Dairy Congr., The Hague*, 1953, **3**, 1381-1388. [Central Inst. Nutrit. Res. T.N.O., Utrecht.]

4221

EVANS, R. J., DAVIDSON, J. A. and BAUER, D. H. Changes in composition of crude egg protein preparations when kept under refrigeration for several years. *Poultry Sci.*, 1954, **33**, 208-209. [Dept. Agric. Chem., Michigan State Coll., East Lansing.]

Crude egg white and egg yolk proteins were prepared and stored for up to 49 months in a refrigerator. Between the 8th and 49th months there was loss of methionine 5.3, cystine 21.6 and lysine 14.0 per cent. No apparent browning took place. It is suggested that the loss may have been due to a sugar-amino-acid reaction.—J. S. Thomson.

4222

DAHLINGER, E. L. and LEWIS, M. N. Precooked and fresh frozen beef roasts. Total weight

loss, drip loss, and tenderness. *J. Amer. Dietetic Assoc.*, 1954, **30**, 362-364. [Dept. Dietetics, Ohio State Univ. Hosp., Columbus.]

4223

POOL, M. F., MECCHI, E. P., LINEWEAVER, H. and KLOSE, A. A. The effect of scalding temperature on the processing and initial appearance of turkeys.

KLOSE, A. A. and POOL, M. F. Effect of scalding temperature on quality of stored frozen turkeys. *Poultry Sci.*, 1954, **33**, 274-279; 280-289. [W. Reg. Res. Lab., Albany, Calif.]

Groups of 10 carcasses from 6-month-old Broad Breasted Bronze turkeys were scalded at temperatures of 122° to 140° F. for 30 to 120 sec. and thereafter processed by commercial dressing machinery. Half the group was chilled in slush ice and the other in air at 39° F. The toms were New York dressed and the hens eviscerated; the carcasses were then frozen at -30° F. for at least 48 hr. and held at -5° F.

Raising the temperature of scalding was more favourable to feather removal than increasing the time beyond 60 sec., but skin was lost as a result. Air chilling gave very uniform weight loss within a group, smaller with lower scalding temperature. For the second part of the study the New York dressed toms were frozen in wooden boxes lined with waxed paper and 2 groups had an additional layer of water-saturated paper pulp to reduce moisture loss and freezer burn. The eviscerated hens were packed in twist-sealed, heat-shrunk plastic bags stored in wooden boxes lined with paper.

The gross weight loss before thawing for the New York dressed toms was 1 per cent. per box; individual results for the thawed carcasses showed that the higher the scalding temperature, the greater the loss, irrespective of the method of chilling. Ice-chilled birds lost over twice as much as air-chilled. The paper pulp halved the moisture loss. Eviscerated hens stored in plastic bags showed a negligible weight loss over 12 months at -5° F., and little change in appearance, whereas New York dressed toms scalded at the higher temperatures were unacceptable in appearance after 3 months' storage.

Fat rancidity was slight in all the stored carcasses, most being observed in the exposed visceral fat of eviscerated hens.

All birds were acceptable to the taste panel in respect of toughness of roasted breast or leg muscle and skin. Variations in scalding and chilling had no effect on muscle toughness; scalding at 140° F. toughened the skin, but this could be overcome by the cooking procedure. The findings on toughness were confirmed by shear force measurements by the Warner Bratzler apparatus.—M. J. Head.

4224

PIPPEN, E. L., CAMPBELL, A. A. and STREETER, I. V. Flavor studies. Origin of chicken flavor. *J. Agric. Food Chem.*, 1954, **2**, 364-367. [W. Utilization Res. Branch, Agric. Res. Serv., U.S. Dept. Agric., Albany 6, Calif.]

Studies were made of the contributions to flavour by the gross parts of chicken carcasses. The standard conditions of preparation of broth, nominally by cooking for 3 hr., are described. The results were those assigned by a taste panel of 8 judges.

The layer of fat which covered it contributed little to the flavour or odour of the broth. When meat, bones and skin were cooked separately and compared with broth made from these in natural proportions most of the flavour was found in the meat, rather less in the composite material and much less in the bones or skin. Results for odour were similar. No significant difference was found to exist between light and dark meat. Cold water extraction removed important precursors of the flavour of the meat but results for odour were not so definite.—D. Harvey.

4225

TARE, H. L. A., BOYD, J. W. and BISSETT, H. M. Experimental preservation of fish and beef with antibiotics. *J. Agric. Food Chem.*, 1954, **2**, 372-375. [Pacific Fish. Exp. Stat., Vancouver 2, B.C.]

When ice containing 1, 2 or 4 p.p.m. chlorotetracycline (aureomycin hydrochloride) or 2 p.p.m. chlorotetracycline plus 200 p.p.m. KH_2PO_4 , uniformly distributed, was used to preserve eviscerated lingcod landed within 24 hr. of capture the bacterial counts after a fortnight were only about one-seventh of those with ordinary ice, and on organoleptic examination fish iced in the ordinary way showed obvious staleness 4 or 5 days earlier than the experimental fish. Similar good results were obtained when red spring salmon was stored on the boat for 6 days at -1° C. in sea water containing 2 μg . chlorotetracycline per ml. Immersion of Coho salmon for 1 min. in sea water containing chlorotetracycline before icing with ordinary ice was not effective, but immersion of lingcod for 1 min. in a 3 per cent. salt solution plus 50 or 100 μg . chlorotetracycline per ml. before ordinary icing gave bacterial counts after 10 days negligible compared to those with brine alone.

Added chlorotetracycline was found to be fairly stable in minced fish or beef stored for 2 days at 4° C. but was rapidly destroyed by heating. The A.O.A.C. pad-plate microbiological method of estimating chlorotetracycline was not satisfactory for estimations on fish preserved with ice containing chlorotetracycline.—W. M. Deans.

N.A. and R., October 1954

4226

NIKKILÄ, O. E. and LINKO, R. R. **Denaturation of myosin during defrosting of frozen fish.** *Food Res.*, 1954, **19**, 200-205. [Central Lab., Tukkukauppojen Oy, Turku, Finland.]

Changes in frozen fish, resulting in a drier muscle with a coarser texture, are thought to be due to denaturation of the proteins. In this work loss of brine-extractable myosin was used as a measure of denaturation. Myosin N was estimated in brine extracts of fillets of Baltic herring (*Clupea harengus* var. *membranus*) either fresh or after freezing in an air blast at -35° , storing at -20° and defrosting in air at 18° C. The results are shown graphically.

After about 17 hours' defrosting, brine-extractable myosin N declined gradually in fish frozen immediately after *rigor mortis*. In fish frozen during *rigor mortis* the fall began earlier and was much more rapid. Brine-extractable myosin N was greater during defrosting and subsequent storage in fish which had been stored for 34 or 58 hr. before freezing than in those frozen fresh. Freezing and defrosting for a second time reduced brine-extractable myosin N to very low amounts. These results are in conflict with the views of other workers that immediate freezing, followed by thawing, filleting and refreezing, has no adverse effect on quality.—W. M. Deans.

4227

SIEBURTH, J. F., WAHL, T. and McLAREN, B. A. **Effect of added softeners on moisture content of bread.** *J. Amer. Dietetic Assoc.*, 1954, **30**, 355-357. [Dept. Home Econ., State Coll. Washington, Pullman.]

Breads made from white or whole wheat flour with or without 0.5 per cent. polyoxyethylene stearate or 1.5 to 3.5 per cent. potato starch were stored for 3 days at 30° C. and relative humidity 85 per cent. Whole wheat bread lost moisture more slowly than did white bread. The stearate reduced the rate of water loss from the white but not from the whole wheat bread. Potato starch had no appreciable effect.—F. C. Aitken.

4228

SINGH, R., RAFIQUE, M. and BAINS, G. S. **Investigations on the preparation and use of sweet potato and groundnut cake flours in conjunction with wheat for leavened bread (*dabal roti*) and chapatis.** *Indian J. Agric. Sci.*, 1953, **23**, 139-146. [Milling and Baking Lab., Punjab Agric. Coll., Lyallpur.]

The value of sweet potato flour prepared from scalded or unscalded tubers was studied. Scalding had the effect of inactivating undesirable enzymes which caused discolouration, and partially gelatinising the starch, which improved the quality of the

dough for chapatis. For such use up to 30 per cent. of the wheat could be replaced. When groundnut cake was the replacement not more than 5 per cent. could be used.

When leavened bread was to be prepared the limit of replacement by each flour was 5 per cent. D. Harvey.

4229

MILNER, M. and THOMPSON, J. B. **Grain storage. Physical and chemical consequences of advanced spontaneous heating in stored soybeans.** *J. Agric. Food Chem.*, 1954, **2**, 303-309. [Kansas State Coll., Manhattan.]

The physical appearance of samples of soya beans from 2 typical instances of spontaneous heating in storage bins is described, and the results of chemical analyses are tabulated and contrasted with those for soya beans heated directly. The findings are discussed in conjunction with the literature and previous work by one of the authors (Title 3023, Vol. 15; Absts. 1422, 3917, Vol. 16). It was concluded that actual combustion did not occur but that the main chemical change in the second stage of spontaneous heating was the exothermic browning (Maillard) reaction, for which soya beans supply ample proteins and sugars, and also trace elements, such as Cu, which possibly catalyse the reaction. It is suggested that this reaction may play a part in the heating of other stored crops also.

A theory of the process of heating in soya beans stored in bulk is put forward, with practical recommendations.—W. M. Deans.

4230

ROBERTS, R. L., POTTER, A. L., KESTER, E. B. and KENEASTER, K. K. **Effect of processing conditions on the expanded volume, colour, and soluble starch of parboiled rice.** *Cereal Chem.*, 1954, **31**, 121-129. [W. Reg. Res. Lab., Albany, Calif.]

In the parboiling of rice, colour development increased rapidly as steaming temperature rose to 212° F. There was an increase also in soluble starch content and in the degree of expansion of the dry milled rice when heated in air at 482° F. It is suggested that estimation of soluble starch and degree of expansion might form a basis for measuring the degree of parboiling.

J. S. Thomson.

4231

HUMMEL, B. C. W., CUENDET, L. S., CHRISTENSEN, C. M. and GEDDES, W. F. **Grain storage studies. 13. Comparative changes in respiration, viability, and chemical composition of mold-free and mold-contaminated wheat upon storage.** *Cereal Chem.*, 1954, **31**, 143-150. [Dept. Agric. Biochem., Univ. Minnesota, St. Paul.]

4232

MANN, G. E., HOFFMAN, W. H. (Jr.) and AMBROSE, A. M. Oilseed processing. Detoxification and toxicological studies of tung meal. *J. Agric. Food Chem.*, 1954, 2, 258-263. [S. Reg. Res. Lab., New Orleans, La.]

The cakes or meals obtained by the expression or extraction of tung oil from the seed have long been known to be toxic to livestock. It is shown that a meal prepared by extraction of tung kernels with hexane cannot be detoxified completely by extraction with ethanol and subsequent autoclaving at pressures of 10 or 21 lb. per sq. in. Tung cake prepared by a commercial expeller process was almost completely detoxified by extraction with ethanol. Rats were used as the test animals.—W. Godden.

4233

ALTSCHUL, A. M. The effect of processing conditions on the nutritive value of cottonseed meal for poultry. A review. *Poultry Sci.*, 1954, 33, 180-185. [S. Reg. Res. Lab., New Orleans, La.]

4234

LONGCHAMP, R. and GAUTHERET, R. J. Recherches sur la conservation des pommes de terre par l'hydrazide maléique. [Preservation of potatoes with maleic hydrazide.] *Ann. agronom.*, 1954, 5, 207-224. [Stat. Physiol. Végétale, Versailles.]

4235

MERRIDEW, J. N. and RAYMOND, W. F. Laboratory drying of herbage by radio-frequency dielectric heating. *Brit. J. Appl. Phys.*, 1953, 4, 37-39. [Dept. Agric. Eng., Univ. Durham.]

Grass can be dried rapidly by radio-frequency dielectric heating under laboratory conditions. In a radio-frequency oven the moisture content of 300 g. herbage can be reduced from 80 per cent. to 10 to 25 per cent. in 15 min. Drying can be completed in an ordinary oven at 100° C. The results for dry matter by this procedure are on an average 0.5 per cent. higher than those obtained with an efficient hot air oven.—W. Godden.

4236

SKRZYŃSKI, T. Doświadczenia nad mechanicznym suszeniem zielonek i użytkowaniem suszu. [Experiments with mechanical drying of green roughages and their utilisation after drying.] *Rocz. Nauk rol.* [B], 1953, 66, No. 4, 69-108. English and Russian summaries.

From the results of experiments general conclusions are stated showing the advantages of artificially dried green crops. Young legumes are the most suitable crop. Technical instructions

and advice on the operation for obtaining optimum results are given. The importance of the enterprise as a source of home-produced concentrates in Poland is emphasised. (From summary.)

T. D. Bell.

4237

AXELSSON, J. Use of molasses, grains, and other additives in making grass silage. *Vith Internat. Grassland Congr.*, 1952, 1153-1158. [Inst. Animal Nutrit., Royal Agric. Coll. Sweden, Upsala.]

A review.

4238

JARL, F. and HELLBERG, A. Ensileringsförsök med sura natriumsalter av fosforsyra och svavelsyra. [Ensiling experiment with acid sodium salts of phosphoric and sulphuric acid.] Tabellbilaga till Meddelande Nr 54. [Tabular appendix to Medd. No. 54.] *Kgl. Lantbrukshögsk. Statens Husdjursförsök Medd.* No. 54, 1954, pp. 38+16. English summary.

Preliminary trials were made with 6 salts, of which NaH_2PO_4 was later omitted on account of its high price and high P content, double superphosphate because of its high F content and NaHSO_4 because of its high S content and laxative effect. There remained NaH_2PO_4 with 1, 2 or 3 molecules of NaHSO_4 . Silage was made in small and big concrete silos and in pits. The small silos had drains from which the effluent could be collected. Each series had control samples put down with A.I.V. solution and without addition. The crops were grass, clover and alfalfa and a few samples of yellow sweet lupin. The results are presented in detail.

The preserving action of the salt increased with its content of sodium acid sulphate, but since the suitability of this in a feed was in doubt, most work was done with the salt with least sulphate, to which the following summary refers. Increasing the amount of salt from 1 to 2 per cent. of the fresh weight of crop made little difference to losses from the silage. The P content of the silage was increased by 2 to 2.5 g. per kg. when 1.5 per cent. of salt was used.

It made little difference whether the salt was used dry or in solution. Under good conditions 1 per cent. gave good silage: under bad conditions 2 per cent. gave slightly better quality. Compared with A.I.V. silage, in general pH, ammonia, lactic acid and acetic acid were all higher in phosphate silage and losses of nutrients were sometimes slightly greater, but there was no more butyric acid. Yellow sweet lupin gave consistently good results.

An appendix, printed separately, gives supplementary tabular data.—I. Leitch.

N.A. and R., October 1954

- 4239
COWAN, R. L., BRATZLER, J. W. and SWIFT, R. W. Experiences with sodium bisulfite as a preservative for grass silage. *J. Animal Sci.*, 1953, 12, 939. *Proc.* [Pennsylvania State Coll.]
- 4240
ALLEN, R. S. and JACOBSON, N. L. Effects of various treatments on some components of legume-grass silage. *J. Animal Sci.*, 1953, 12, 937. *Proc.* [Iowa State Coll.]
- 4241
HVIDSTEN, H. and GLOPPE, K. E. Halm-luting. En enkel metode til bestemmelse av lutstyrken og utvaskingsgraden av halmen i praksis. [Beckmann treatment of straw. A simple method for control of the lye concentration and the effect of washing.] *Norsk Landbruk*, 1953, 19, 122-123. English summary.
- 4242
HOMB, T. Luting av halm. [Predigestion of straw.] *Norsk Landbruk*, 1953, 19, 380-383; 420-423.
- 4243
SAHASRABUDHE, M. R. Studies on the keeping quality of mustard oil. *Bull. Central Food Technol. Res. Inst. Mysore*, 1954, 3, 89.
See also Absts. 4348, 4349, 4360, 4390, 4397, 4415, 5080, 5612.

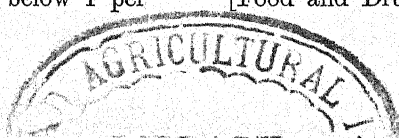
2. CHEMICAL COMPOSITION OF FOODSTUFFS

(Except Vitamins, for which see Section 3.)

ENERGY VALUE, PROXIMATE PRINCIPLES AND INORGANIC CONSTITUENTS

GENERAL

- 4244
AHMAD, K., KARIM, M. A. and DE, H. N. Choline contents of some common Bengal foodstuffs. *Indian J. Med. Res.*, 1953, 41, 441-445. [Div. Biochem. Nutrit., Univ. Dacca, E. Pakistan.]
Choline was estimated in 27 species of fish and 33 vegetables by the ammonium reineckate method of Luecke and Pearson (Abst. 2911, Vol. 14). For the fish, values ranged from 15.6 to 37.7 mg. choline chloride per g. dry tissue. Values ranging from 0.88 to 25.10 mg. per g. were found in vegetables.—P. C. Jowsey.
- 4245
PEREIRA E SANTOS, P. O. Os ácidos gordos essenciais nas gorduras alimentares portuguesas. [Essential fatty acids in food fats in Portugal.] *Agronom. lusitana*, 1953, 15, 193-242. [Estação Agron. Nac.] English summary.
Linoleic, linolenic and arachidonic acids were estimated spectrophotometrically in olive, groundnut, sesame, coconut and palm oils, butter, margarine and lard. Linoleic acid was found in all, linolenic in all except coconut oil, but arachidonic acid in butter and lard only. The average daily intake per head of essential fatty acids in Portugal was 3614.2 mg., equivalent to 1.47 per cent. of the daily energy intake.
It is pointed out that in any attempt to raise the average daily energy intake, attention should be paid to the ratio of essential fatty acids to energy so that intake of energy in the form of essential fatty acids should not fall below 1 per cent. of the total, which is the minimum recommended by the National Research Council (Washington).—P. C. Jowsey.
- 4246
PAGES, A. Contribution à l'étude de l'alimentation du bétail à Madagascar. [Feeding of cattle in Madagascar.] *Rev. Élevage Méd. vét. Pays trop.*, 1953, 6, 229-234.
The compositions of 52 feeds which are or could be used for livestock feeding in Madagascar are presented in 7 tables under the headings grass and legume hays; green fodders; meadow grasses, straws, chaff and roots; cereal grains and seeds; silages and vegetable flours; brans; meat and fishmeals.—T. D. Bell.
- 4247
Vos, H. J. Sporenelementen in voedingsmiddelen. [Trace elements in foods.] *Conserva*, 1954, 8, 241-244. [Centraal Inst. Voedingsonderzoek T.N.O., Utrecht.] English summary.
Trace elements are important not only as essential components of food but because of their effects on the keeping quality of foods and because of possible poisoning. Cu, Sn and Fe may spoil colour and flavour of butter and tinned foods, and the corrosion of the tins may be accelerated by trace elements.—I. Leitch.
- 4248
LARKIN, D., PAGE, M., BARTLET, J. C. and CHAPMAN, R. A. The lead, zinc and copper content of foods. *Food Res.*, 1954, 19, 211-218. [Food and Drug Labs., Ottawa.]



Changes towards the use of organic insecticides in agriculture and of stainless steel in the food industry prompted the study which was made of 171 samples of processed foods. The results are tabulated and it is considered that, in general, the Pb, Zn and Cu contents of these Canadian foods are satisfactory.—D. Harvey.

4249

INSTITUTO DE NUTRICIÓN DE CENTRO AMÉRICA Y PANAMÁ, GUATEMALA. Tercera edición de la tabla de composición de alimentos de Centro América y Panamá. [Table of composition of foods of Central America and Panama. Third edition.] *Bol. Ofic. sanit. panamer.*, 1953, *Suppl.* 1, 129-149.

4250

FLORES, M. Datos sobre la composición de los alimentos y de algunos platos típicos salvadoreños. [Data on the composition of foods and some typical dishes of El Salvador.] *Sanidad en El Salvador*, 1951, 2, 283-287.

4251

FLORES, M. and MENDEZ, J. Tabla provisional de composición de alimentos de Centro América. [Provisional table of composition of the foods of Central America.] *Sanidad en El Salvador*, 1951, 2, 337-356.

4252

HARRIS, R. S. Plantas comestíveis nativas da America Central. [Edible plants native to Central America.] *Arq. brasil. Nutrição*, 1953, 9, 14-26. *Proc.* [Massachusetts Inst. Technol., Cambridge.]

FOODSTUFFS OF ANIMAL ORIGIN

Milk and Milk Products

4253

ROBERTS, H. R., PETTINATI, J. D. and BUCEK, W. A comparative study of human, cow, sow, and rat milk using paper chromatography. *J. Dairy Sci.*, 1954, 37, 538-545. [National Dairy Research Laboratories, Inc., Oakdale, Long Island, N.Y.]

The chromatograms of human, cow, rat and sow milk, obtained after removal of proteins and salts, showed some marked differences. All contained lactose, but in addition human milk contained 11 other unidentified spots, compared with 10, 6 and 8, for cow, rat and sow milk, respectively. Trace quantities of glucose and galactose were found in cow and sow milk, and human milk contained glucose, but rat milk contained neither galactose nor glucose. There are strong indications that the additional spots in these chromato-

grams represent substances of a carbohydrate nature. The samples of human milk were taken at 3, 7, 23 and 44 days *post partum*: those of cow's milk at 3, 27, 51, 75 and 147 hours *post partum*; those of rat's milk at 1, 3, 6 and 13 days *post partum*. The lactating day for the sow's milk was not known.—M. B. Richards.

4254

DE MUNTER, P. Relations entre protéines et matières grasses du lait. Etude statistique. [Relations between protein and fat in milk. A statistical study.] *Bull. Inst. agronom. Gembloux*, 1953, 21, No. 1/2, 29-36.

A study is made of sets of data for the protein and fat contents of milk published by Bonnier, Antoine and De Vuyst. Finding, with Bonnier's data, that a linear regression of protein content on fat content did not give a satisfactory fit, the author went on to fit a relationship of exponential type, which did fit the data. A similar procedure applied to Antoine's data also gave improved fit, but it was not suited to the third set of results. The theoretical difficulties are discussed that arise in the analysis of sets of data, such as the second and third sets considered, if their collection is not carefully designed from a statistical point of view.

I. McDonald.

4255

SRINIVASAN, P. R. and RAMANATHAN, M. K. Protein and sulphur amino acids in breast-milk of poor class Indian women in the Nilgiris. *Indian J. Med. Res.*, 1954, 42, 51-54. [Nutrit. Res. Labs., Indian Counc. Med. Res., Coonoor, S. India.]

Milk samples were collected from 25 apparently healthy Indian mothers and from 6 who had a child suffering from kwashiorkor.

The average protein content of the milk of both groups, and its methionine content, were comparable with those given for white American and British women. The cysteine content was slightly lower. There was no difference between the 2 groups of Indian women. [No data are given of the total yield of milk, or of the ages of the children with kwashiorkor and their diet apart from breast milk.]—F. E. Hytten.

4256

MORTON, R. K. The lipoprotein particles in cow's milk. *Biochem. J.*, 1954, 57, 231-237. [Dept. Biochem., Univ. Cambridge.]

In an attempt further to characterise the lipoprotein particles of milk (see Abst. 1624, Vol. 24), 2 types of particles were isolated, one from buttermilk, the other from separated milk, by procedures which are described. Comparative analyses of chemical and enzymic composition were made and electron micrographs were prepared.

N.A. and R., October 1954

The particles from buttermilk were opaque and orange-pink in colour. By the presence in them of total lipid, nucleic acid P, alkaline phosphatase, xanthane oxidase and diaphorase they resembled the microsomes isolated from mammary tissue, and the term "milk microsomes" is proposed for them. In the electron micrograph the particles were in indefinite clumps. They possessed no succinic dehydrogenase or cytochrome oxidase activity.

The particles from separated milk were clear and translucent; they contained much less lipid than the microsomes, and had little enzyme activity. In the electron micrograph these casein particles showed a regular and distinctive clumping.

D. Harvey.

4257

SMITH, L. M. and JACK, E. L. **The unsaturated fatty acids of milk fat. 1. Methyl ester fractionation and isolation of monoethenoid constituents. 2. Conjugated and nonconjugated constituents.**

SMITH, L. M., FREEMAN, N. K. and JACK, E. L. **3. Geometrical isomerism.** *J. Dairy Sci.*, 1954, **37**, 380-389; 390-398; 399-406. [Dept. Dairy Indust., Univ. California, Davis.]

1. The concentrations of unsaturated fatty acids, weight per cent. as calculated from methyl ester distillation data, were: decenoic 0.19, dodecenoic 0.27, tetradecenoic 1.52, hexadecenoic 3.12, octadecenoic 33.14, linoleic plus other unsaturated acids 4.03. The methyl esters were prepared by a procedure with pentane as solvent, and for low temperature crystallisation for 24 hr. at -21°C . pentane was better than the 2 other solvents, absolute ether and absolute methanol, which were tested. For separating saturated and unsaturated methyl esters such crystallisation was more efficient than extractive crystallisation with urea.

2. The amounts of polyunsaturated fatty acids in Californian milk fats agreed with data published elsewhere. Methyl esters of polyethenoid fatty acids were concentrated by removal of saturated and monoethenoid components as described. Milk fat was shown to contain small amounts of conjugated and nonconjugated dienoic, trienoic and tetraenoic fatty acids with carbon chain lengths 18 or longer.

3. Infra-red absorption spectra were recorded for C_{18} , C_{16} , C_{14} , C_{12} , and C_{10} monoethenoid methyl ester fractions of milk fat and for three C_{18-20} fractions containing different distributions of polyethenoid constituents; the spectral similarities and differences are discussed.—D. Harvey.

4258

DHARMARAJAN, C. S., VENKATESWARA RAO, R. and DASTUR, N. N. **Freezing point of cow and buffalo milk. 4. Effect of some factors on the freezing point of milk.** *Indian J. Vet. Sci.*,

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1953, **23**, 249-267. [Indian Dairy Res. Inst., Bangalore.]

4259

DHARMARAJAN, C. S., VENKATESWARA RAO, R. and DASTUR, N. N. **Composition of milk of Indian animals. 5. Freezing point, lactose, chloride and acidity in goat and sheep milk.** *Indian J. Vet. Sci.*, 1954, **24**, 51-61. [Indian Dairy Res. Inst., Bangalore.]

Samples of goat's milk from individual animals and bulk samples from the Institute herd and from outlying farms showed an average freezing-point depression of 0.579°C . and 0.14 per cent. lactic acid. For the samples from the outlying farms lactose content was on the average 4.45 per cent. and Cl 0.127 per cent. Samples of ewe's milk from the Institute's flock of North Gujarat sheep had an average freezing-point depression of 0.587°C . and titratable acidity of 0.17 per cent. lactic acid. Colostrum of both ewes and goats collected at the first milking or two gave a slightly higher freezing-point depression than normal milk.—W. Godden.

4260

UVAROV, O. and MUGGLETON, P. W. **Penicillin levels in cow's milk after intramammary infusion of procaine penicillin.** *Vet. Rec.*, 1954, **66**, 200-202. [Glaxo Laboratories, Ltd., Greenford, Middlesex.]

4261

FILIPOVITCH, DJ. **Étude sur les variations de la densité du lait de mélange. [Variations in the density of bulked milk.]** *Lait*, 1954, **34**, 129-132. [Lab. Vet. Stat., Sarajevo, Jugoslavia.]

4262

SVENDSEN, A. B. and JERMSTAD, A. **Amino acids in gammelost. A paper chromatographic investigation.** *Netherlands Melk Zuiveltijdschr.*, 1954, **8**, 29-33. [Pharm. Inst., Univ. Oslo.] Dutch summary.

Gammelost is a Norwegian cheese made from acidified, pasteurised, skimmed milk by the Hardanger or the Sogn method. Both types were examined. The ripe cheese has a higher protein N and lower free amino-acid N and ammonia N contents in the inner than in the outer layers. The free amino-acids were extracted by aqueous alcohol and after evaporation of the alcohol were separated and identified by 2-dimensional paper chromatography. Amino-acids normally present were: glutamic acid, aspartic acid, serine, glycine, threonine, glutamine, alanine, proline, γ -aminobutyric acid, valine, phenylalanine, leucine and isoleucine. Lysine and ornithine were frequently present and in some samples tyrosine and possibly α -aminobutyric acid.—W. Godden.

4263

SCHORMÜLLER, J., LIESE, H. and WINTER, H. Beiträge zur Biochemie der Käsereifung. 2. Die Stickstoffbilanz im Verlauf der Reifung von Sauermilch-Magerkäse verschiedener Herstellungsart. [Biochemistry of cheese ripening. 2. Nitrogen balance during the ripening of sour skimmed milk cheese made in different ways.] 3. Das Verhalten des Arginins im Verlauf der Reifung. [3. Behaviour of arginine in the course of ripening.] *Ztschr. Lebensmittel-Untersuch. Forsch.*, 1954, **98**, 258-274; 347-358. [Inst. Lebensmittelchem., Tech. Univ., Berlin, Charlottenburg.]

2. Very detailed studies were made of changes in the nitrogen fractions during the ripening of Harz cheese (sour skimmed milk cheese) made in the usual way with 1.8 kg. salt, 0.40 kg. NaHCO_3 and 0.10 kg. CaCO_3 per 50 kg. curd, or with the same proportion of salt, 0.75 kg. NaHCO_3 and 0.38 kg. CaCO_3 to accelerate ripening, or with nothing added. The methods are briefly described and the results are presented in graphs and in tables giving true protein N, residual N, soluble and insoluble protein N and soluble N.P.N. as percentages of crude protein N, and amino-acid N, peptide N, ammonia N and urea N as percentages of residual N and of crude protein N.

During normal ripening (about a fortnight), soluble protein and residual N increase. Amino-acids are the principal constituent of residual N. As a percentage of crude protein N, amino-acids, ammonia and urea increase during ripening; peptides also at first, but in over-ripe cheese these decline.

In accelerated ripening soluble protein decreases instead of increasing. The proportion of free amino-acids is smaller and that of peptides greater and as a result the flavour of the cheese is insipid. It is concluded that hastening ripening has no advantage from the point of view of nutritive value or quality.

The widely different changes in unsalted curd are also described. The product is unpalatable and useless.

3. The material was as above; arginine was estimated by the method of Kraut *et al.* (*Hoppe-Seyler's Ztschr.*, 1950, **286**, 248) and the results are presented in tables.

During normal ripening only about 8 per cent. of the arginine was lost, less during accelerated ripening, and the cheese contained no free arginine or only a trace. It was concluded that neither normal nor accelerated ripening affects the biological value of the protein so far as arginine is concerned, and that arginine has nothing to do with the flavour of this cheese.

W. M. Deans.

4264

LAL, S. B. and CHAUDHURY, S. P. R. Nutritive value of ice-cream. *J. Indian Med. Assoc.*, 1954, **23**, 297-299. [Pub. Health Labs., Patna.]

See also Absts. 4389, 5182.

Eggs

4265

SPRINGER, R. and WOLLER, R. Die Bindungsformen des Schwefels im Hühnerei. 4. Mitteilung zur Kenntnis des Proteinschwefels. [Sulphur compounds in the hen's egg. 4. On protein-bound sulphur.] *Biochem. Ztschr.*, 1954, **325**, 376-379. [Inst. Pharm. Lebensmittelchem., Univ. Munich.]

The dry matter of egg white and egg yolk contain, respectively, 1.974 and 1.929 per cent. total S, of which 0.003 and 0.007 is sulphate S. Of the protein-bound S in egg white 71.2 per cent. is present as methionine and 28.2 per cent. is cystine-cysteine. For egg yolk the figures are 92 and 8 per cent., respectively.—W. Godden.

4266

WILCOX, F. H. (Jr.) and COLE, R. K. Studies on the lysozyme concentration in the egg white of the domestic fowl. *Poultry Sci.*, 1954, **33**, 392-397. [Dept. Poultry Husbandry, Agric. Exp. Stat., Cornell Univ., Ithaca, N.Y.]

4267

GABUTEN, A. R. and SHAFFNER, C. S. A study of the physiological mechanisms affecting specific gravity of chicken eggs. *Poultry Sci.*, 1954, **33**, 47-53. [Dept. Poultry, Univ. Maryland, College Park.]

Meat (All Kinds)

4268

SCHWEIGERT, B. S., BENNETT, B. A. and GUTHNECK, B. T. Amino acid composition of organ meats. *Food Res.*, 1954, **19**, 219-223. [Div. Biochem. Nutrit., American Meat Inst. Found., Chicago, Ill.]

Ten amino-acids were estimated in composite samples from 2 sources of liver, kidney, heart, brain, pancreas, lung and spleen from beef, pork and lamb carcasses. Liver had more leucine, valine and methionine than other organs; lung and spleen tended to have less of several acids than the other organs. The tryptophan content of pork pancreas was high compared with that of the other organs of each species.—D. Harvey.

4269

LOFGREEN, G. P. and GARRETT, W. N. Creatinine excretion and specific gravity as related to the

N.A. and R., Octobe 1954

composition of the 9, 10, 11th rib out of Hereford steers. *J. Animal Sci.*, 1954, **13**, 496-500. [Dept. Animal Husb., Univ. California, Davis.]

Nine long-yearling steers were full-fed on a ration containing oat hay 40, ground barley 43, dried beet pulp 12, cottonseed meal 4, oyster shell flour 0.5 and salt 0.5 per cent. A similar group of 9 received the same ration except that the cottonseed meal was replaced by 3.8 per cent. dextrose and 0.2 per cent. KH_2PO_4 . Animals from each group were killed at intervals from 94 to 154 days from the start. Before slaughter each steer was fed on oat hay alone for 12 days and creatinine was estimated in the total urine during the last 5 days. The ninth-tenth-eleventh-rib cut was taken from the right side of each carcass by the method of Hankins and Howe (Abst. 1609, Vol. 17). The sp. gr. of the cut was measured and the lean, fat and bone were separated manually and their sp. gr. was measured.

Creatinine excretion per unit bodyweight and the percentage of separable lean in the soft tissue of the rib cut showed a significant correlation ($r = +0.67$). The separable fat (F) of the rib sample could be predicted accurately from the sp. gr. (G_w) of the whole rib cut by the equation

$$F = \frac{1.155 - G_w}{0.261}$$

W. Godden.

4270

HANSEN, R. P. and McINNIS, A. G. **Volatile acids of ox perinephric fat.** *Nature*, 1954, **173**, 1093. [Fats Res. Lab., D.S.I.R., Sydney St. W., Wellington, N.Z.]

A sample of beef suet from the perinephric fat was steam-rendered and the glycerides were hydrogenated with an Ni catalyst. The products were saponified with KOH, the soaps converted to acids and the fatty acids steam-distilled. The steam distillate was neutralised with KOH and the individual K soaps were isolated by the gas-liquid partition chromatographic technique of James and Martin (Abst. 77, Vol. 22). All the acids from C_2 to C_{10} inclusive were identified and evidence was obtained of the presence of another unidentified acid, possibly an isomer of decanoic acid.—W. Godden.

4271

GARTON, G. A. and DUNCAN, W. R. H. **Dietary fat and body fat: the composition of the back fats of pigs fed on a diet rich in cod-liver oil and lard.** *Biochem. J.*, 1954, **57**, 120-125. [Rowett Res. Inst., Bucksburn, Aberdeenshire.]

The inner and outer back fats of 2 pigs which had been fed on a diet containing, finally, 50 per

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cent. of a mixture of equal parts by weight of lard and cod liver oil were examined. The composition of the ration, the feeding and post-mortem findings on the animals have been reported elsewhere (Abst. 5334, Vol. 23). The back fats from one animal were separated by crystallisation from 10 per cent. solution in acetone at -40°C ., giving 68 per cent. of an insoluble glyceride fraction with an iodine value approximating to that of lard, and 32 per cent. of soluble glycerides with a much higher iodine value. From an estimation of the fatty acids in these 2 glycerides it was concluded that the lard and cod liver oil were absorbed almost unchanged and deposited additively along with typical "synthesised" pig fat in the depots. Depletion of anti-oxidant, vitamin E, then occasioned oxidation of the polyethenoid fatty acids of the cod liver oil.—W. Godden.

4272

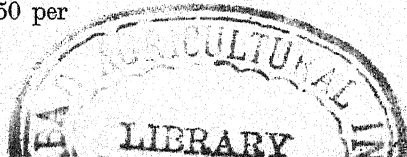
WENIGER, J. H. and FUNK, K. Untersuchungen über den Calcium- und Phosphorgehalt ganzer Schweinekörper. [Calcium and phosphorus content of entire bodies of pigs.] *Arch. Tierernährung*, 1953, **3**, 325-341. [Inst. Tierzucht, Martin Luther Univ., Halle, Wittenberg.]

After a brief outline of the occurrence and function of Ca and P in the animal body and the need for adequate supplies in the ration, earlier work, particularly that of Lawes and Gilbert, on the amount of Ca and P in pig carcasses is reviewed.

From material available from trials previously reported (Abst. 1327, Vol. 24) Ca and P were estimated in different parts of the carcasses from a large number of pigs of 5 breeds slaughtered at different liveweights. In all parts of the carcass, free of skin and bone, P greatly exceeds Ca. In the skeleton the reverse is true. With minor variation the ash of the total bones from pigs of 130 kg. liveweight contains 37.0 per cent. Ca and 17.89 per cent. P. Average values are given for the weight of fresh bones and ash as a percentage of the fresh bone for 209 pigs of 5 breeds and at 5 different liveweights. The percentage of ash rises steadily from 17.3 at 30 kg. liveweight to 24.2 at 150 kg. liveweight. A table is given showing the calculated weight of Ca and P in the bones per kg. liveweight from 1 to 150 kg. liveweight. Figures for 3 breeds of pigs at 130 kg. liveweight show that pigs with a high fat content, owing to lower proportion of bone in the carcass, have lower total Ca and P contents and a narrower Ca : P ratio. Three newborn piglets were analysed and found to contain on the average 10.81 g. Ca and 6.32 g. P per kg. liveweight, figures in close agreement with those of Bartels (*Arch. Tierernährung u. Tierzucht*, 1930, **3**, 287) and Radeff (*ibid.*, 1930, **3**, 639).

W. Godden.

29



4273

STOB, M., ANDREWS, F. N. and ZARROW, M. X. **The detection of residual hormone in the meat of animals treated with synthetic estrogens.** *Amer. J. Vet. Res.*, 1954, **15**, 319-322. [Dept. Animal Husb., Purdue Univ., Lafayette, Ind.]

A preliminary experiment with mice from which the ovaries had been removed and which were fed on a standard diet with or without the addition of diethylstilboestrol showed that, without the hormone, atrophy of the uterus was almost complete 2 weeks after removal of the ovaries. Assay by uterine weight for diethylstilboestrol given by mouth was 4 times as sensitive as the vaginal smear technique and gave significant results with 0.0055 μ g. hormone per g. ration. This method was used for the examination of beef muscle taken from the neck of control steers and of others which had had an implant of diethylstilboestrol or a subcutaneous injection of an emulsified hormone preparation containing both dieneoestrol and progesterone, 168 days before slaughter. The results indicated that beef from animals treated in this way did not contain more than 0.01 μ g. residual hormone per g. dried meat. A more detailed report of work with other species and other tissues is to be presented elsewhere.—W. Godden.

4274

WIERBICKI, E., CAHILL, V. R., KUNKLE, L. E. and DEATHERAGE, F. E. **A comparative study of the eating quality and biochemical characteristics of the meat from bulls, steers and bulls treated with diethylstilbestrol.** *J. Animal Sci.*, 1953, **12**, 904. *Proc.* [Ohio Agric. Exp. Stat.]

Fish

4275

STANSBY, M. E. **Composition of certain species of fresh-water fish. 1. Introduction: the determination of the variation of composition of fish.** *Food Res.*, 1954, **19**, 231-234. [Pacific Coast and Alaska Technol. Res., Fish and Wildlife Serv., Seattle, Wash.]

Because of the variability in composition of fish, and inadequate sampling, many of the figures quoted are worthless. The Fish and Wildlife Service plans to collect more satisfactory data for freshwater fish. The method of preparing samples for analysis is briefly described. Results, based on 16 specimens of each species, will be reported for 5 species of Lake Erie fish in part 2 of this series.

W. M. Deans.

FOODSTUFFS OF VEGETABLE ORIGIN

General

4276

DESHPANDE, P. D. and RADHAKRISHNA RAO, M. V. **Nitrogen complex and amino-acid composition**

of (i) amaranth (*Amaranthus gangeticus*) and (ii) aconite bean (*Phaseolus aconitifolius*). *Indian J. Med. Res.*, 1954, **42**, 77-83. [Dept. Nutrit., Haffkine Inst., Bombay 12.]

Air-dried amaranth (*Amaranthus gangeticus*) leaves had the following percentage composition: moisture 8.77, N 4.76, ether extract 4.70, ash 17.13, carbohydrate (by difference) 39.17, Ca 3.16, P 0.64, MgO 2.50, and contained 0.12 mg. Fe per 100 g. Much of the N was not extractable by water, 5 per cent. NaCl, 70 per cent. alcohol or 0.1 per cent. NaOH and of that extracted nearly two-thirds was N.P.N. The leaves contained between 1 and 2 per cent., on a dry basis, of lysine, leucine, isoleucine, arginine and valine, estimated microbiologically, but were low in cystine and methionine.

Powdered aconite beans (*Phaseolus aconitifolius*) had the following percentage composition: moisture 9.48, N 3.91, ether extract 1.21, ash 3.10, carbohydrate (by difference) 61.76, Ca 0.22, P 0.10, MgO 0.84, and contained 0.009 mg. Fe per 100 g. Nearly 90 per cent. of the N was extractable by alkali and at least four-fifths of this was protein. The beans contained between 1 and 2 per cent. of lysine, leucine, isoleucine, phenylalanine and tyrosine, but were low in cystine and methionine.

Both are considered likely to be valuable as supplements to rice or wheat diets, on account of their lysine.—W. M. Deans.

4277

THOMAS, H. R. and LEWIS, M. N. **Sodium values of seven frozen vegetables.** *J. Amer. Dietetic Assoc.*, 1954, **30**, 327-328. [Dept. Dietetics, Ohio State Univ. Hosp., Columbus.]

There were variations in the sodium content of different samples of a vegetable. Average values in mg. per 100 g. material as purchased were: asparagus 1.89, broccoli buds 19.94, cauliflower 16.22, green beans 1.26, Lima beans 151.49, peas 129.95, spinach 42.41.

In low-sodium diets fresh Lima beans and peas are preferable to the frozen products.

F. C. Aitken.

See also Abst. 4152.

Cereals

4278

PARKS, V. B., HEWSTON, E. M., MARSHALL, M. W. and BRUINOOG, A. M. **Developing breads of higher nutritive value.** *J. Amer. Dietetic Assoc.*, 1954, **30**, 245-250. [Bur. Human Nutrit., U.S. Dept. Agric., Washington, D.C.]

The objective was the production of breads rich in protein, calcium and vitamin B₁ to improve the nutritive value of school lunches. Six breads were prepared with 5.5 to 10 per cent. non-fat milk

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solids: they were white, raisin, wholewheat-white, soya-white, soya-wheatgerm-white and brewer's-yeast-white. Enriched white flour was used. Commercial baking tests, palatability tests and analyses were made. All except the bread containing extra yeast could be baked commercially. The yeast bread was the least palatable. Estimation of nutritive value of the breads from tables of composition of ingredients underestimated Ca content by about 5 per cent. and overestimated vitamin B₁ content by 25 per cent., except for the yeast bread where vitamin B₁ was underestimated by 33 per cent. as compared with the results of chemical analyses. Analytical data showed that the high levels of milk solids in the breads increased Ca and protein content at the expense of vitamin B₁ content, since the amount of flour was reduced.

F. C. Aitken.

4279

MARKUZE, Z. and SZACHOWSKA, M. Zawartość wapnia, fosforu i żelaza w mąkach pszennych i żytnich różnego przezięcia. [The calcium, phosphorus and iron contents of wheat and rye flour of different extraction rates.] *Rocz. Państwowego Zakł. Hig.*, 1954, 5, 79-84. [Z Zakładu Badania Żywności i Przedmiotów Użytku PZH.] Russian and English summaries.]

Three samples of wheat flour and 3 of rye flour of different extraction rates were analysed. In the wheat flours 100 g. dry matter contained 0.56 to 1.40 g. ash, 1.5 to 3.5 mg. Fe, 24 to 41 mg. Ca and 150 to 332 mg. total P. For the rye flours the values were 0.78 to 1.83, 1.6 to 4.0, 23 to 44 and 143 to 406, respectively. All the values increased as the rate of extraction rose. [From summary.]

W. Godden.

4280

HILL, R. and TYLER, C. The effect of increasing acidity on the solubility of calcium, magnesium and phosphorus in certain cereals and pure salts. *J. Agric. Sci.*, 1954, 44, 293-305. [Royal Agric. Coll., Cirencester.]

The solubilities of Ca, Mg, total P, phytate and non-phytate P in bran, wheatmeal and oatmeal alone or with the addition of varying amounts of CaCO₃ were measured over the pH range 6.5 to 1.0. Similar measurements were made for certain mixtures of CaCO₃, Na₃PO₄, phytin, sodium phytate, precipitated calcium phosphate and trimagnesium phosphate. In each case 10 g. of the cereal was mixed with 10 times its weight of water of which the pH had been adjusted by addition of N HCl. The reaction proceeded for 1 hr., after which the supernatant liquid was poured off, centrifuged and filtered, and estimations of pH and soluble constituents were made on the filtrate.

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The Ca in bran and wheat was not so soluble as that in oats but in all cases solubility increased, most rapidly in oats, as the pH decreased. Mg dissolved more readily from the cereals at higher pH values than did Ca. The solubility of Ca in CaCO₃ added to the cereals varied with the cereal, but it was always completely soluble at pH 3.0 and below. The curves for solubility of total P in cereals with reference to pH varied with the cereal. They all showed a rise at first as pH decreased from 6.0 to a maximum at about 4.5 to 5.0 and then a more or less marked and rapid fall to a minimum at pH 2.0, followed by a further steep rise in wheat and oats, slight in bran, to pH 0.5. The effect of added CaCO₃ on the shape of the solubility curve varied with the cereal and with the amount of CaCO₃ added. The results for solubility of phytate P were affected by the activity of phytase present in the cereal, which varied with the pH. This effect was negligible in oats, as the enzyme was absent or inactive.—W. Godden.

4281

HILL, R. and TYLER, C. The influence of time, temperature, pH and calcium carbonate on the activity of the phytase of certain cereals. *J. Agric. Sci.*, 1954, 44, 306-310. [Royal Agric. Coll., Cirencester.]

The hydrolysis of phytate in wheat, bran and oats by the phytase present was studied under different conditions. Oats were shown to have almost no phytase activity. The optimum pH for wheat phytase was 5.0 to 5.1, but activity persisted down to pH 3.0. If the acidity was reduced to pH 2.5 for 5 min. and then restored to pH 5.0 by the addition of NaHCO₃, the phytase did not recover its activity. With rise in temperature from 15° to 50° C. there was a uniform increase in the rate of hydrolysis which decreased as the reaction proceeded but continued until only a very small amount of soluble substrate remained. Ca present under conditions in which it could form insoluble phytate reduced phytate hydrolysis to a considerable degree.—W. Godden.

4282

HILL, R. and TYLER, C. The effect of decreasing acidity on the solubility of calcium, magnesium and phosphorus in bran and certain pure salt solutions. *J. Agric. Sci.*, 1954, 44, 311-323. [Royal Agric. Coll., Cirencester.]

Two lots of bran were prepared from the same bulk sample; one was acidified to pH 2.0 with HCl and the other to pH 5.1. The volumes of liquid were the same in each case. Both samples were kept for 2 hr. at 37° C. after which the pH of the second sample was reduced to 2.0 by adding acid. At pH 2.0 all phytase was destroyed (see preceding abstract). Sample 2 is referred to as

"hydrolysed" and sample 1 as "unhydrolysed" bran. The precipitation of Ca, Mg and P from these samples as the pH was raised stepwise to 6.5 by the addition of 1.0 N NaCO₃ was studied using added amounts of 50, 200 or 800 mg. Ca as CaCO₃.

In both samples precipitation of Ca was only slightly increased by raising pH but was greater in amount and began at lower pH in the unhydrolysed than in the hydrolysed bran. When 50 mg. Ca as CaCO₃ was added it was almost completely precipitated at pH 6.5, somewhat less being precipitated over the whole pH range from the hydrolysed than the unhydrolysed bran. With the higher amounts of added Ca the changes were of a similar type, except that at the higher pH precipitation was not so complete. At pH 2.0 over 90 per cent. of the total Mg in both samples of bran was soluble. With hydrolysed bran in none of the mixtures was 50 per cent. or more of the Mg precipitated, even at pH 6.5 with added Ca. In the mixtures containing unhydrolysed bran, when no Ca was added 72.5 per cent. of the Mg was precipitated at pH 6.5 and with 50 mg. Ca added 56.0 per cent.

With unhydrolysed bran the curves for soluble phytate P and soluble total P were almost parallel and therefore only phytate P solubilities need be considered. The soluble phytate P value in the bran alone rose very slowly as pH increased from 2.0 to a maximum at about 5.0 and then decreased by about 50 per cent. at pH 6.4. As the amount of Ca added rose from 50 to 800 mg. the solubility of phytate P began to decrease at lower pH until with 800 g. Ca the decrease began at pH 3.0 and precipitation was almost complete at 4.5. With 50 mg. Ca present the amounts of Ca and Mg precipitated at pH 6.5 were insufficient to produce a base-saturated phytate but with 200 mg. present penta- and hexacalcium phytates were precipitated at pH 3.5 to 5.0. At low pH, with 800 mg. Ca present, the penta-salt, but at high pH the hexa-salt, appeared to be precipitated.

With hydrolysed bran alone, increasing the pH caused practically no precipitation of P despite the presence of 41.8 mg. phytate P. With 50 mg. Ca added 50 per cent. of the total P was precipitated at pH 6.5 and with 200 and 800 mg. Ca present this level of precipitation was attained at pH 5.5 and 4.6, respectively. In all cases phytate P was precipitated somewhat earlier than phosphate P. With 50 mg. Ca present the compound precipitated at pH 4.0 to 5.8 was pentacalcium phytate. At pH 6.0 the ratio of Ca to Mg corresponded to base-saturated phosphate or phytate as tetracalcium dimagnesium phytate. With higher amounts of Ca added the precipitate consisted mainly of hexacalcium phytate and tri-calcium phosphate.

Similar experiments with phytin, sodium phytate and sodium phosphate, with varying amounts

of added CaCO₃, are reported and the results indicate that not only the ratio of Ca : P but the actual concentrations present affect the degree of precipitation.

These results are considered in relation to the precipitations which are likely to occur in the small intestine, and the possible effects of such precipitations on absorption of Ca and P are discussed.—W. Godden.

4283

HILL, R. and TYLER, C. **The reaction between phytate and protein.** *J. Agric. Sci.*, 1954, **44**, 324-326. [Royal Agric. Coll., Cirencester.]

In the first paper of this series (see above Absts.) it was found that the phytate P in bran, wheat and oats was less soluble at pH about 2.2 than at higher and lower pH values. Earlier work by Fontaine *et al.* (Abst. 2760, Vol. 16) suggested that protein might be responsible for such results. A study of the solubility of phytate P in the presence of wheat gluten over the pH range 0.5 to 6.5 showed that the fall in solubility in the region of pH 2.5 was due to reaction with protein and that this reaction could be reduced considerably by adding Ca.—W. Godden.

4284

RAMA RAO, G. and SWAMINATHAN, M. **Chemical composition of different varieties of bajra.** *Bull. Central Food Technol. Res. Inst. Mysore*, 1953, **3**, 68.

Moisture, protein, ether extract, ash, P, Ca, Fe and vitamin B₁ were estimated in 6 varieties of bajra (pearl millet, *Pennisetum typhoides*). The results are given in detail. There was little difference between varieties.—P. C. Jowsey.

4285

LAKKE GOWDA, H. S. **Studies on jola or jowar (*Andropogon sorghum*) as cattle fodder. 2. Chemical composition of "White" variety of jola at different stages of growth.** *Indian J. Dairy Sci.*, 1954, **7**, 19-24. [Mysore Serum Inst., Hebbal, Bangalore.]

For part 1, see Abst. 4090, Vol. 23.

White jola, sown in experimental plots, was cut 8 times during the growing season, starting when the plants were 3 weeks old and continuing till the bloom stage. Contents of the dry matter of the first and last cuts per cent. were: organic matter 84.59 and 93.98, crude protein 29.93 and 9.93, crude fibre 24.44 and 38.50, N-free extract 26.22 and 44.22, ether extract 4.00 and 1.33, ash 15.41 and 6.02, CaO 1.06 and 0.36, MgO 1.20 and 0.54, P 1.29 and 0.48.—J. S. Thomson.

4286

ACKER, L. and ERNST, G. Über das Vorkommen eines phosphatidspaltenden Ferments in Cerealien. [Occurrence of a phosphatide-splitting enzyme in cereals.] *Biochem. Ztschr.*, 1954, **325**, 253-257. [Inst. Lebensmittelchem., Univ. Frankfurt a. Main.]

4287

BANERJEE, R. M. and DAS, N. B. Studies on the diastatic activity of certain Indian wheats. *Indian J. Agric. Sci.*, 1954, **24**, 45-49. [Indian Agric. Res. Inst., New Delhi.]

4288

SZYMCZYK, F. and KOLANKIEWICZ, J. O naturalnej zawartości arsenu i ołowiu w zbożach polskich. [The natural arsenic and lead content of Polish cereals.] *Rocz. Państwowego Zakł Hig.*, 1954, **5**, 53-59. [Z Zakładu Badania Żywności i Przedmiotów Użytku PZH.] Russian and English summaries.

4289

MILLS, G. L. Some observations on the electrophoresis of gliadin. *Biochim. biophys. Acta*, 1954, **14**, 274-281. [S.A. Courtauld Inst. Biochem., Middlesex Hosp., London, W. 1.] French and German summaries.

See also Abst. 5284.

Fruits

4290

WILLIAMS, K. T. and BEVENUE, A. Some carbohydrate components of tomato. *J. Agric. Food Chem.*, 1954, **2**, 472-474. [W. Utilization Res. Branch, Agric. Res. Serv., U.S. Dept. Agric., Albany 6, Calif.]

Ripe tomatoes were scalded, peeled, comminuted and extracted exhaustively with 80 per cent. ethanol. Of the total solids 81 per cent. was soluble and consisted of fructose and glucose 59.7, sucrose 3.5, protein ($N \times 6.25$) 6.2, and unidentified material 11.6 per cent. The 19 per cent. of total solids insoluble in alcohol consisted of an araban-galactan-mixture, a xylan fraction, pectin, cellulose and protein in approximately equal proportions.—W. Godden.

Other Types

4291

DA GAMA, M. V. and DE FREITAS, F. C. Uma deficiência de manganésio. [A deficiency of manganese.] *Agronom. lusitana*, 1953, **15**, 249-257. [Estação Agron. Nac.] English summary.

Ca, Mg, K, Na, Mn and Fe were estimated in 36 samples of leaves from several different plant species growing near Cartaxo. Of these 23 were

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from plants showing signs of manganese deficiency; the average Mn content was 6.6 p.p.m. The rest were from apparently normal plants and had an average Mn content of 40 p.p.m. A series of soil samples was analysed also. Some of the vegetation with signs of Mn deficiency was growing on soils in which a high level of exchangeable Mn was present.—P. C. Jowsey.

4292

CERBULIS, J. Sugars in Caracas cacao beans. *Arch. Biochem. Biophys.*, 1954, **49**, 442-450. [Stephen F. Whitman and Son, Inc., Philadelphia, Pa.]

4293

SAHASRABUDHE, M. R. Mustard oil. *Bull. Central Food Technol. Res. Inst. Mysore*, 1953, **3**, 69-72.

Pasture, Hay and Silage

4294

DAVIES, C. W. and HUGHES, R. B. The organic acids of grass extracts. *J. Sci. Food Agric.*, 1954, **5**, 200-205. [Edward Davies Chem. Labs., Univ. Coll. Wales, Aberystwyth.]

Aqueous extracts were made of heat-dried samples of perennial rye, cocksfoot and timothy grasses. After concentration and the removal of amino-acids by Zeo-Karb 215 they were examined by ion exchange chromatography. Although the proportions of the acids in them varied the grasses were closely similar and 12 organic acids were found to be present of which 6, acetic, lactic, succinic, malic, malonic, and citric, were identified. The lactic acid may have originated by catalytic action in the resin column. Oxalic, tartaric and isocitric acids were not detected.

Preliminary studies of changes during growth and of diurnal variations are recorded. These and the study of losses of volatile acids during drying and extraction are being pursued.

D. Harvey.

4295

HULME, A. C. and RICHARDSON, A. The non-volatile organic acids of grass. *J. Sci. Food Agric.*, 1954, **5**, 221-225. [Ditton Lab., D.S.I.R., East Malling, Kent.]

The non-volatile organic acids were extracted from a dried mixture of meadow foxtail and meadow fescue by 80 to 85 per cent. alcohol. After the alcohol was evaporated the residual liquid was decolorised with de-activated charcoal, diluted to 500 ml. with water and passed down a column of Zeo-Karb 215 to remove all amino-acids and cations. The effluent and washings were passed down a column of Amberlite IR₄B on which the acids were absorbed. The column was

washed with water to remove all sugars and the acids were then displaced by 0.1 N HCl. The eluate and washings, after removal of CO₂, were passed down a Dowex 2 column from which, after washing, the acids were again displaced by 0.1 N HCl and successive 2 ml. fractions were collected. These fractions were submitted to paper chromatography. Quinic acid was proved to be present and the presence of succinic, malic, malonic and citric acids was indicated (*cf.* preceding Abst.). Two other acids, not identified, one of which appeared to be allied constitutionally to quinic acid, were present. In an aqueous extract of the dried grasses chlorogenic acid was found.

W. Godden.

4296

CLONINGER, W. H. and HERMAN, H. A. **Study of composition of Missouri grown roughages.** *Missouri Agric. Exp. Stat. Res. Bull.*, 533, October 1953, pp. 51.

Data are given for 215 samples of dried roughage and 29 samples of silage grown by Missouri dairymen during the period 1950-1952. In addition to proximate principles, values are given for carotene, ash, Ca, P, K, Mg and Fe; for hay crops additional data are given for Mn, Cu, Co and Zn.

J. S. Thomson.

4297

CONIGER, W. H. and HERMAN, H. A. **A study of composition of Missouri grown roughages.** *J. Animal Sci.*, 1953, 12, 911-912. *Proc. [Univ. Missouri.]*

4298

TELES, A.d.N. As ervagens de anafe dos arredores de Lisboa. (Subsídios para o seu estudo fitosociológico e químico.) [The melilot pastures of the neighbourhood of Lisbon. Data for their phytosociological and chemical study.] *Agronom. lusitana*, 1953, 15, 259-313. [Estação Agron. Nac.] French summary.

Most of this paper is concerned with the results of an ecological survey of the area. The chemical composition of some species is given.

P. C. Jowsey.

4299

DOUGALL, H. W. **Fertilizer experiments on grassland in the Kenya Highlands.** *E. African Agric. J.*, 1954, 19, 171-178. [Dept. Agric., Kenya.]

A series of plots were laid down to test the effect of factorial combination of P as superphosphate and N as sulphate of ammonia on the establishment of leys and on the productivity of established grass and natural pastures, including rough grazing. Herbage was cut when it had reached a stage of growth considered suitable for grazing and on the permanent grass a further application of N was

given after each cutting. Yields of fresh material were recorded and samples of the first cut only were taken for estimation of H₂O, P and Ca.

For ley establishment a single dressing of 1½ cwt. sulphate of ammonia (20 per cent. N) per acre to the seed bed was beneficial but higher dressings did not seem justifiable. The dressing of superphosphate (18 per cent. citric-soluble P₂O₅) should rarely exceed 3 cwt. per acre. On permanent grass dressings of N may be beneficial at intervals during the growing season but only if the pasture is fenced and adequately stocked and has adequate water supplies. The dressing of superphosphate should rarely exceed 3 cwt. per acre.

In ley establishment phosphate fertilisers increased the P percentage in the dry matter, but reduced that of Ca. The yields per acre of crude protein, P and Ca in the crop were all increased. On permanent pasture both percentage in dry matter and yield of crude protein, P and Ca per acre were all increased.

In newly sown leys N, apart from very high dressings, had little effect on the yield of crude protein, P or Ca per acre, but in permanent pasture the yields of all three increased as the dressing increased. The effects of pH of the soil and rainfall during the month before cuttings on the above results are briefly discussed.

W. Godden.

4300

DOUGALL, H. W. **The chemical composition of three "weeds" in the Kenya Highlands.** *E. African Agric. J.*, 1954, 19, 152-153. [Dept. Agric., Kenya.]

The weeds were spurrey (*Spergula arvensis*), plantain (*Plantago lanceolata*) and campion (*Silene gallica*, L.). In the above order they had the following percentage composition on the dry matter: ash 17.29 to 19.14, 12.19 and 25.75; crude protein 27.5 to 30.3, 21.01 and 22.48; ether extract 1.92 to 7.69, not estimated, 2.05; crude fibre 13.46 to 14.14, not estimated, 11.25; carbohydrate 34.06 to 34.48, not estimated, 38.47; P₂O₅ 0.88 to 1.08, 0.75 to 0.88 and 0.58; CaO 0.77 to 1.32, 1.56 to 2.32 and 1.81.

J. S. Thomson.

4301

CURASSON, M.-G. Études sur les pâturages tropicaux et sub-tropicaux. [Studies of tropical and sub-tropical pastures.] *Rev. Élevage Méd. vét. Pays trop.*, 1953, 6, 243-266.

A review.

4302

GILLARD, A. Les pâturages de la région de Fianarantsoa (Madagascar). [Pastures in the region of Fianarantsoa (Madagascar).] *Rev. Élevage Méd. vét. Pays trop.*, 1953, 6, 213-228.

N.A. and R., October 1954

Five types of pasture are described and the areas which they cover are outlined on a coloured map. The main plant species occurring in them are: type 1, Danga (*Heteropogon contortus*, P.B.) and Vero (*Hyparrhenia rufa*, Stapf.); type 2, Ahipisika, which includes *Stenotaphrum dimidiatum*, R.Br., *Axonopus compressus*, P.B. and *Paspalum conjugatum*, Berg, and Tenina (*Imperata cylindrica*, L.); type 3, Kifafa (*Aristida* spp.) and *Trichopteryx stipoides*, Hackel; type 4 is a mixture of types 1 and 3; type 5 is a mixture of 2 with Kifafa and Vero. Local and botanical names of other species which also exist on these different types are listed. A table is given showing the relative numbers of bulls, bullocks, male calves, cows and heifers which graze on these areas and also the total cattle population for 16 districts in the region under survey. An appendix contains climatological data for the different types of pasture and also data on the composition of 5 main species of plants.

W. Godden.

4303

MOON, F. E. **The composition and nutritive value of hay grown in the east of Scotland and the influence of late applications of nitrogenous fertilisers.** *J. Agric. Sci.*, 1954, **44**, 140-151. [Edinburgh and E. Scotland Coll. Agric.]

Results of experiments made between 1948 and 1951 inclusive are reported.

The composition of unfertilised hays from all centres in all years is given in detail. Average values were as follows in the order total nutrients in per cent. dry matter, digestibility per cent. (sheep), digestible nutrients in per cent. dry matter: crude protein 6.32, 40.0, 2.92, ether extract 1.44, 40.3, 0.61, crude fibre 33.95, 56.7, 19.65, N-free extract 51.97, 59.2, 30.27. Average starch equivalent was 33.8.

Application of sodium nitrate or "Nitrochalk" 10 to 20 days before cutting produced a significant increase in the protein content of grasses, mostly in the digestible protein fraction. The protein of clover was unaffected. Treatment with 1 to 3 cwt. fertiliser per acre produced an average increase of 46 per cent. in the digestible protein of seeds hays and of 31 per cent. in meadow hays.

Significant increases in the yield of aftermath from late fertiliser treatments often amounted to 4 to 5 cwt. dry matter per acre. The botanical composition of aftermath on meadow was not usually affected but in seeds aftermath, clovers were greatly suppressed.

N recovery amounted to 30 to 35 per cent. in the hay crop and up to 25 per cent. in aftermath.

It was concluded that it would be profitable to use N fertiliser, applied shortly before cutting, on hay crops, particularly seeds hays, grown in the east of Scotland.—P. C. Jowsey.

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4304

BROWN, W. O. **Composition and quality of crop silages made in Northern Ireland.** *Res. Exp. Rec. Minist. Agric. N. Ireland*, 1952, 25-27. [Minist. Agric. N. Ireland.]

The records of analyses of 321 samples of cereal-legume silage submitted to the Ministry during 1940 to 1952 have been surveyed and the classified results are compared with those for grass silage samples during 1940 to 1948 (see Abst. 4842, Vol. 20). Before 1946 most of the samples came from towers or upright containers, after 1946 mainly from trenches. About half the samples had less than 20 per cent. dry matter and in this sense were unsatisfactory, this being particularly true since 1946. Only about 20 per cent. of the samples could be regarded as balanced for milk production on the basis of protein content; 46 per cent. contained less than 12 per cent. protein. The pH value of 30 per cent. was below 4.2; 45 per cent. had values above 4.6. Appraisal by colour and smell classified 20 per cent. of the silages before 1946 as overheated; after that year only 8 per cent. were overheated but the percentage classed as sour or butyric rose from 16 to 36 per cent.

W. Godden.

4305

JÓHANNESSON, B. and KRISTJÁNSDÓTTIR, K. **Efnasamsetning grass á ýmsum aldursstigum og hæfni þess til votheysgerðar. [Chemical composition of grass at different stages of growth and its suitability for making silage.]** *Atvinnudeild Háskólans Reykjavík Rit Landbúnaðardeilda B-Flokkur*, No. 6, 1954, 21-37. English summary.

Grass was sampled at different stages of growth. As the season advanced protein decreased and fibre, soluble sugars and carbohydrates increased. Varietal differences, seasonal variations and soil fertility level affected the slope of the time-composition curves.

Chopped grass at different stages of growth was ensiled in glass jars, sealed to exclude air and sampled at intervals of from 20 to 120 days after storage.

Grass cut at the earliest stages of growth generally reached the lowest pH in spite of the low content of sugars and hydrolysable carbohydrate. It was computed that at least 80 per cent. more carbohydrates were converted to lactic acid in a sample cut at the beginning of June than in one cut a month later.

During storage in the laboratory silos a great breakdown of protein occurred. For example, grass cut early in June contained 23.0 per cent. protein and after storage for 4 months the silage contained 8.5 per cent. A sample cut early in July contained 10.5 per cent. protein and after storage for 3 months contained 4.9 per cent. (From summary.)—P. C. Jowsey.

MISCELLANEOUS

- 4306
HART, H. V. **Creta praeparata as a source of the iron in flour.** *Analyst*, 1954, **79**, 305. [Res. Assoc. Brit. Flour Millers, Cereal Res. Stat., St. Albans, Herts.]

The Fe content of 8 samples of *creta praeparata* ranged from 57 to 91 mg. per 100 g. The amount in 14 oz., the amount to be added to 280 lb. flour under the Flour Order 1953, would increase the Fe content of the flour by approximately 0.25 mg. per 100 g.—W. Godden.

- 4307
HOLLENBECK, C. M., DANNER, W. E. and MAHONEY, J. F. **The stability of procaine penicillin in feeds.** *Poultry Sci.*, 1954, **33**, 425-427. [Res. Labs., Chem. Div., Merck and Co., Inc.]

Procaine penicillin, obtained from a number of different sources, was incorporated at a level of 20 g. per ton into commercial poultry rations, which were then pelleted and stored with a 10 per cent. moisture content.

After 30 days of storage at 100° F., assay of pellets for penicillin activity by the method of Esposito and Williams (*Federation Proc.*, 1952, **11**, 208) gave values ranging from 10 to 88 per cent. of the original activity for pellets made up with procaine penicillin preparations of the type used in pharmacy. Ten feed mixes prepared by a different method [details not stated] gave a mean recovery of 97 per cent. after this period of storage.

Storage for the same period at 75° F. caused less destruction even with "pharmaceutical" types of procaine penicillin preparations, the recoveries ranging from 14 to 100 per cent. of the original activity.—K. J. Carpenter.

3. VITAMINS

GENERAL

- 4308
CLAYTON, M. M., BABCOCK, M. J., FOSTER, W. D., STREGEVSKY, S., TUCKER, R. E., WERTZ, A. W. and WILLIAMS, H. H. **A referee blood experiment involving the use of microchemical methods.** *J. Nutrition*, 1954, **52**, 383-393. [Dept. Home Econ., Maine Agric. Exp. Stat., Orono.]

Samples of serum frozen and packed in dry ice were sent to 6 laboratories for microchemical estimation by the method of Bessey *et al.* (György, "Vitamin Methods I", 1950, Acad. Press, Inc., New York) of Hb, ascorbic acid, vitamin A and carotene.

Replicate estimations were consistent at each individual laboratory but there were large differences between laboratories, some having consistently high and some low results for each estimation. For ascorbic acid and carotene the variations were of a magnitude similar to the variations found in any individual subject from day to day. Duplicate readings at the 6 laboratories on the Beckman spectrophotometer varied less than the chemical estimations of which they were part.

A list is given of the causes of differences and of precautions to be taken in order to minimise them.

V. R. Jackson.

- 4309
FLORES, M. **Principios básicos y material de enseñanza sobre vitaminas. [Basic principles and data for teaching about vitamins.]** *Sanidad en El Salvador*, 1951, **2**, 313-315.

- 4310
SQUIBB, R. L., GUZMAN, M. A. and SCRIMSHAW, N. S. **Effect of high environmental temperatures on metabolism. 1. Growth and blood constituents of rats exposed to 94° F. for 72 hours.** *J. Nutrition*, 1954, **52**, 155-163. [Inst. Agropecuario Nac., Guatemala City.]

Male adult rats received a synthetic diet to appetite or with intake restricted to 5 g. daily. For 72 hr. they were kept at a temperature of 76° F. and humidity from 35 to 75 per cent., or of 94° F. and humidity from 50 to 75 per cent. Several tests were made. At the end of the test the rats were killed and total protein, riboflavin, total carotenoids, vitamin A, ascorbic acid, alkaline phosphatase and phosphorus were estimated in the blood serum.

With food to appetite the rats at the higher temperature reduced their food intake significantly, lost much weight and had the higher mortality rate. The level of total carotenoids was not affected but riboflavin, vitamin A, ascorbic acid and alkaline phosphatase were significantly lowered, and total serum protein rose significantly. When the food intake was restricted to 5 g. daily, the rats at both temperatures lost weight to the same extent. At the high temperature, serum values for carotenoids, riboflavin, alkaline phosphatase and P were unaffected, but those for vitamin A and ascorbic acid were significantly lowered; serum protein was raised in 3 out of 4 tests, but the average increase was not significant.

V. R. Jackson.

N.A. and R., October 1954

4311

MACDONALD, H. E. **Avitaminosis complicated by lack of minerals.** *Canad. J. Comp. Med.*, 1954, **18**, 147-148. [Vermilion, Alta.]

4312

GAL, E. M. and GREENBERG, D. M. **Non-specific reversal by vitamins of inhibition of ethanol oxidation by antabuse (tetraethylthiuram-disulfide) in the rat.** *Proc. Soc. Exp. Biol. Med.*, 1954, **85**, 252-254. [Dept. Physiol. Chem., Sch. Med., Univ. California, Berkeley.]

4313

BREÅKKAN, O. R. and PROBST, A. Vitaminer i norsk fisk. 1. Nikotinsyre-, riboflavin-, panto- tensyre-, vitamin B₁₂- og vitamin A-innholdet i hel fisk og forskjellige organer fra fersk sild (*Clupea harengus*) og makrell (*Scomber scombrus*). [Vitamins in Norwegian fish. 1. The content of nicotinic acid, riboflavin, pantothenic acid, vitamin B₁₂ and vitamin A in the whole fish and different organs of herring (*Clupea harengus*) and mackerel (*Scomber scombrus*).] *Fiskeridirektoratets Skr., Ser. Teknol. Under- søkelser*, 1953, **11**, No. 13, pp. 10. English summary.

Fish were sampled, fresh from the boats, at the time when they were biggest and the catches heaviest. Methods of preparation are described; the B vitamins were estimated by microbiological methods, vitamin A spectrophotometrically (conversion factor 1900), except where the amount to be estimated was small, when the SbCl₃ reaction was used. It was found impossible to remove riboflavin from hard roe by acid extraction; digestion with papain and takadiastase was satisfactory but only a few samples were thus treated.

Values for number, weight, dry matter, fat, ash, protein (N × 6.25), and the vitamins are presented for herring and mackerel separately, distinguishing whole fish, muscle, liver, hard and soft

roe, and the remainder of the viscera [in the tables called intestines], for male and female separately.

The B vitamin values in µg. per g. without distinction of sex, for herring and then mackerel, whole fish, muscle, liver, hard and soft roe were as follows: nicotinic acid 30.5, 39, 50, 18.8, 14.3; 63, 93.5, 79, 21, 22; riboflavin 2.6, 3.3, 7.4 (1.7), 2.6; 5.7, 3.6, 11.3 (2.2), 9.2; pantothenic acid 9.3, 9.5, 21.0, 14, 14.3; 10.7, 10.3, 33.3, 11.8, 46; vitamin B₁₂ 0.11, 0.14, 0.39, 0.07, 0.11; 0.14, 0.12, 0.52, 0.07, 0.30. Vitamin A values in I.U. per g. in the same sequence were: 13, trace, 610, —, 1.5; 96, trace, 4670, —, 5.—I. Leitch.

4314

ROULET, M. A. Les vitamines du sol et leur action sur les végétaux. [Vitamins of the soil and their effect on plants.] *Mitt. Geb. Lebens- mittel. Hyg.*, 1954, **45**, 12-15. *Proc.* [Berne.]

4315

LECOQ, R. Essai de quelques facteurs vitamini- ques, introduits par voie intraveineuse, sur la réserve alcaline du plasma sanguin. [Trial of some vitamin factors introduced intravenously on the alkali reserve of the blood plasma.] *C.R. Soc. Biol.*, 1954, **148**, 71-74.

Adult rabbits received intravenous injections of hesperidoside, leucocyanidol, both members of the vitamin P group, or biotin or cyanocobalamin (vitamin B₁₂) dissolved in physiological saline. The alkali reserve of the blood plasma after 6, 8 and 24 hr. was estimated by Van Slyke's method.

Hesperidoside and biotin caused a rise in alkali reserve while leucocyanidol and vitamin B₁₂ caused a marked and prolonged fall. The effect of the latter substances was thought possibly to be an attempt of the body to counteract the acidosis of vitamin P deficiency and pernicious anaemia by the transference of base from the plasma to the tissues with a consequent fall in alkali reserve.

V. R. Jackson.

VITAMIN A

4316

LEBEDEV, P. T. Usovershenstvovanie metodiki opredeleniya vitamins A v krovi i tkanyakh zhivotnykh. [Improved method of estimating vitamin A in the blood and tissues of animals.] *Sovet. Zootekh.*, 1953, **8**, No. 2, 112.

A diagram is given of a test-tube rack in the form of a small cupboard, which can be closed when not in use so that the standards used for colorimetric comparison in estimating vitamin A can be kept for twice as long as in ordinary test-tube racks; colorimetric comparison can be made in 1 or 2 sec.—W. Hughes.

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4317

KAMATH, G. G. and MAGAR, N. G. **Ultra-violet absorption characteristics of some Indian shark-liver oils.** *Indian J. Med. Res.*, 1953, **41**, 339-347. [Dept. Biochem., Inst. Sci., Bombay, 1.]

Vitamin A was estimated in the liver oil of sharks caught off the Bombay coast. The values in I.U. per g. found by measuring the gross absorption at 328 mµ. and multiplying by 1600 were for boladi (*Rhinoptera javanica*) 1000, khada mushi (*Carcharinus melanopterus*) 10,600, pakat (ray, *Dasybatus uarnak*) 2300, pitori (*Carcharinus limbatus*) 15,400 to 37,300, ranja (skate, *Rhynchobatus*

djeddensis) 2200 and waghbeer (*Galeocerdo tigrinus*) 1800. Values of the same order were obtained by applying the correction procedure of Morton and Stubbs and multiplying by 1800, or by estimations with glycerol dichlorohydrin. Presence of anti-oxidants such as propyl gallate, *nordihydroguaia-*retic acid and various commercial preparations did not significantly affect the absorption at 328 m μ . in the concentrations used.—T. Moore.

4318

AMES, S. R., SWANSON, W. J., RISLEY, H. A. and HARRIS, P. L. **Vitamin A aldehydes: metabolism, biopotency and toxicity.** *Federation Proc.*, 1954, **13**, 174. [Res. Labs., Distillation Products Indust., Div. Eastman Kodak Co., Rochester, N.Y.]

4319

NÚÑEZ, G. Chromatographie de partage des substances liposolubles. 2. Chromatographie sur papier des caroténoïdes. [Partition chromatography of fat-soluble substances. 2. Paper chromatography of carotenoids.] *Bull. Soc. Chim. biol.*, 1954, **36**, 411–413.

The R_F values were measured of certain carotenoids on paper previously treated with olive oil. Increasing the concentration of oil on the paper decreased the R_F . Different alcohols saturated with olive oil were used as developers, that most used being ethanol with varying proportions of pyridine. The R_F values were raised by increasing the proportion of pyridine. Carotene, lycopene and some xanthophylls could be separated, but α - and β -carotene, and zeaxanthin and xanthophyll, could not.—V. H. Booth.

4320

LECOMTE, R. and SEILLEUR, P. Extraction des carotènes en vue de leur détermination. [Extraction of carotenes with a view to their estimation.] *Bull. Inst. agronom. Gembloux*, 1953, **21**, No. 3/4, 14–25.

A method is described for extracting carotene from vegetable tissues. Fresh vegetable material was chopped in a straw cutter and mixed. Between 1 and 2 kg. was frozen at -70°C . under CO_2 and ground in a hammer mill. The powder, still under CO_2 , was transferred to a lyophiliser. After lyophilisation, samples of from 0.5 to 4 g. were weighed into an Erlenmeyer flask and covered with Allihn's refrigerant. One hundred ml. of light petroleum were added, and the mixture was boiled for 15 min. under reflux. The flask was cooled and a portion of the solution was pipetted out for chromatography. In comparison with certain older methods, the method yielded higher carotene values with a lower coefficient of variation

which differed with the nature of the vegetable extracted but was always less than 3.2 per cent.

Dry material was ground in a hammer mill and the extraction with light petroleum followed a similar course.—V. H. Booth.

4321

GARBERS, C. F., EUGSTER, C. H. and KARRER, P. Über die Vitamin-A-Wirkung des *cis*- β -Carotins C (mit behinderter Doppelbindung). [Vitamin A activity of *cis*- β -carotene C (with hindered double bond).] *Helv. chim. Acta*, 1954, **37**, 382. [Chem. Inst., Univ. Zürich.]

Estimated by the rat growth method, *cis*- β -carotene C had about 20 to 25 per cent. of the vitamin A activity of all-*trans*- β -carotene. The C isomer is less stable than other *cis*-isomers of β -carotene, which may explain its inferior activity.

V. H. Booth.

4322

RABOURN, W. J., QUACKENBUSH, F. W. and PORTER, J. W. Isolation and properties of phytoene. *Arch. Biochem. Biophys.*, 1954, **43**, 267–274. [Dept. Agric. Chem., Purdue Univ., Lafayette, Ind.]

4323

BICKOFF, E. M., LIVINGSTON, A. L., BAILEY, G. F. and THOMPSON, C. R. Xanthophylls in fresh and dehydrated alfalfa. *J. Agric. Food Chem.*, 1954, **2**, 563–567. [W. Utilisation Res. Branch, Agric. Res. Serv., U.S. Dept. Agric., Albany 6, Calif.]

A Chilean variety of alfalfa, grown near the laboratory, was harvested at the pre-bloom stage and the pigments were extracted with acetone. The washed extract was chromatographed on a column of calcium hydroxide with or without diatomaceous earth. An extract of a sample of commercial dehydrated alfalfa meal was prepared and chromatographed on a magnesium oxide and Celite column. Of the xanthophylls present in the fresh material, lutein constituted 40 per cent., violaxanthin 34, cryptoxanthin 4, zeaxanthin 2 and neoxanthin 19, making a total of 99 per cent. Seven minor bands also were detected. The same 5 pigments accounted for 87 per cent. of the xanthophylls present in the dehydrated alfalfa meal; of the total carotenoids present in it, 22.6 per cent. was β -carotene.—I. M. Sharman.

4324

DE NICOLA, M. The carotenoids of the carapace of the echinoderm *Ophidiaster ophidianus*. *Biochem. J.*, 1954, **56**, 555–558. [Centro di Biol. del C.N.R., Stazione Zoologica, Naples.]

N.A. and R., October 1954

4325

TANABE, I. [Liver carotenoid and visual purple regeneration.] *J. Osaka City Med. Center*, 1953, 2, 232-235 (English summary p. 243). [Dept. Physiol., Osaka City Med. Sch.]

In experiments with amphibians intramuscular injection of the carotenoids from frog liver in olive oil solution was without effect on the regeneration of visual purple. Ligature of the bile duct caused histological changes and reduction in the carotenoid content of the liver, but there was no significant change in the regeneration of visual purple. (From summary.)—D. Harvey.

4326

HOSOYA, Y. [New studies on rhodopsin.] *J. Osaka City Med. Center*, 1953, 2, 93-96 (English summary p. 152). [Dept. Physiol., Osaka City Med. Sch.]

A review. See Absts. 2245 and 2484, Vol. 21, and preceding Abst.

4327

TAMAI, K. [Effect of methionine on rhodopsin regeneration and on dark adaptation.] *J. Osaka City Med. Center*, 1953, 2, 188-197 (English summary 240-241). [Dept. Physiol., Osaka City Med. Sch.]

Injection of methionine into amphibians at the rate of 0.1 mg. per g. bodyweight increased the regeneration of rhodopsin in the retina, and 3 g. given by mouth to a man improved his rate of dark adaptation. The mechanism of the changes is considered to be the activation of a group of rods which normally are relatively inactive in the regeneration of rhodopsin. (From summary.)

D. Harvey.

4328

KRAUSE, R. F., COOVER, M. O. and POWELL, L. T. Conversion of C¹⁴ carotene to a non-saponifiable substance or substances in the rat. *Proc. Soc. Exp. Biol. Med.*, 1954, 85, 317-319. [Dept. Biochem., Sch. Med., W. Virginia Univ., Morgantown.]

Carotene uniformly labelled with ¹⁴C was suspended in water with Tween 80 as emulsifier, and given by stomach tube to two male rats. The rats were killed 6 and 24 hr. later, and the non-saponifiable substance was extracted from the liver, small intestine and extrahepato-intestinal tissue. The extracts were freed from carotene by chromatography. The non-saponifiable substances were extracted also from the faeces. The vitamin A content of the tissues was estimated by the SbCl₃ method, and the carotene content of the faeces by measuring the extinction of the extract at 450 mμ. The radio-activity of the dry extracts was measured under an end-window Geiger Müller tube.

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The animal killed after 24 hr. absorbed 30.5 per cent. of the total ¹⁴C given and the animal killed after 6 hr., 53.8 per cent. In both animals the rest of the carotene was accounted for in the faeces. The liver, small intestine and other tissues contained, respectively, 4.4, 6.1 and 20.0 per cent. of the ¹⁴C given in the animal killed after 24 hr., and 6.7, 14.1 and 33.0 per cent. in the animal killed after 6 hr. The content of vitamin A in the three tissues was much the same for both rats and was approximately 1000, 30 and 90 μg., respectively, for the two rats.—R. J. Ward.

4329

HIGH, E. G. Studies on the absorption, deposition and depletion of vitamin A in the rat. *Arch. Biochem. Biophys.*, 1954, 49, 19-29. [Lab. Biochem. Res., Prairie View Agric. and Mech. Coll., Tex.]

A single dose of 128 μg. vitamin A acetate was given orally to 45 rats depleted of vitamin A. At 7 time intervals between 1 and 24 hr., rats were killed and the liver, kidneys and plasma were analysed for vitamin A. Within 1 hr. the plasma value for vitamin A rose to 17 from 4 μg. per 100 ml. The maximum concentration occurred after 9 hr. with a value of 42 μg. per 100 ml., and after 24 hr. the level had fallen to 32. Vitamin A appeared in the liver after between 2 and 4 hr. Maximum total deposition was 46 μg. after 6 hr., and the same value was maintained throughout the 24 hr. Vitamin A appeared in the kidneys between the 6th and 9th hr. and after 24 hr. had reached a total of 3.3 μg.

In a second experiment 100 μg. vitamin A acetate were given to each of a number of rats, and at 18 time intervals ranging from 2 hr. to 30 days rats were killed and the liver and kidneys were analysed for total vitamin A. Maximum deposition in the liver was 20 μg.; it occurred after 6 hr. The value remained constant for about 4 days after which it decreased and reached 3.3 μg. after 30 days. Deposition in the kidneys reached a maximum of 7 μg. between the 14th and 23rd day and by the 30th the total had fallen to 3.1 μg. A nearly linear relation was found between hepatic and kidney vitamin A when, 23 to 30 days after treatment, the liver reserves were nearly used up.

In a third experiment rats with an initial hepatic reserve of 625 μg. were given a diet deficient in vitamin A. After 12 days the liver vitamin A had fallen to 174 μg., by 29 days to 79.3 μg. and by 54 days to 7.4 μg. The kidneys content remained fairly constant at about 20 μg. for the first 29 days but fell to 6.1 by the 54th day. Plasma vitamin A behaved in the same way with a concentration per 100 ml. of about 33 μg. for the first 29 days and of 9.0 by the 54th day.

An identical experiment with rats which had initial liver reserves of 62 μ g. of vitamin A gave a similar relationship but the liver reserves fell less rapidly during the early stages.—R. J. Ward.

4330

WAGNER, K. H. Die Abhängigkeit der Resorption fettlöslicher Vitamine (β -Carotin, Vitamin A und Vitamin D) von den verwendeten Lösungsmitteln. [The dependence of absorption of fat-soluble vitamins A and D and β -carotene on the solvent used.] *Klin. Wochenschr.*, 1954, **32**, 87–89. [Inst. Ernährungswissenschaft., Med. Akad., Justus Liebig-Hochsch., Giessen.]

4331

SQUIBB, R. L., GUZMÁN, M. and SCRIMSHAW, N. S. Retención de la carotina y de la riboflavina y niveles séricos de vitaminas en ratas carentes de vitamina A alimentados con cuatro forrajes, achiote y aceite de palma africana. [Retention of carotene and riboflavin and serum levels of vitamins in vitamin-A-deficient rats fed on four forages, achiote and African palm oil.] *Bol. Ofic. sanit. panamer.*, 1953, *Suppl.* 1, 62–68. [Inst. Agropecuario Nac., Guatemala.]

Vitamin-A-depleted white rats of the USDA strain were given diets containing dried desmodium (*Desmodium intortum*), dried Kikuyu grass (*Pennisetum clandestinum*), dried ramie (*Boehmeria nivea*), dried banana leaves, seeds of achiote (*Bixa orellana*), or African palm oil. Retention of carotenoids and riboflavin and serum values for protein, riboflavin, ascorbic acid, alkaline phosphatase, carotenoids, vitamin A and total tocopherols were estimated after 12 days on the test diets.

The results are presented in detail. Carotenoid retention from the materials, in the same order as above, was 57, 77, 41, 66, 44 and 65 per cent. of the amount ingested. Riboflavin retention in the same order was 77, 84, 80, 40, 69 and 68 per cent. In spite of the differences in retention, no great difference was found in the serum values for any constituent.

It is concluded that all the materials tested were good sources of vitamin A for the rat.

P. C. Jowsey.

4332

BERNHARD, K., RITZEL, G. and STEINER, K. U. Über eine biologische Bedeutung der Gallenfarbstoffe. Bilirubin und Biliverdin als Antioxydantien für das Vitamin A und die essentiellen Fettsäuren. [On a biological significance of bile pigments. Bilirubin and biliverdin as anti-oxidants for vitamin A and the essential fatty acids.] *Helv. chim. Acta*, 1954,

37, 306–313. [Physiol. Chem. Inst., Univ. Basle.] English summary.

When rats with a fistula of the thoracic lymph duct were given 1000 μ g. vitamin A, analysis of the lymph showed that about 50 per cent. of the vitamin was absorbed within 24 hr. (Abst. 1498, Vol. 23); if a fistula was made also to the bile duct so that the bile was drawn off, absorption was only from 0.3 to 1.6 per cent., and of carotene 0 to 0.2 per cent. Administration of the natural bile of rats or pigs through a third fistula increased the absorption of vitamin A to about 20 per cent. Taurocholic acid given in the same way caused absorption of from 2.1 to 10 per cent. In other experiments colloidal aqueous suspensions of vitamin A were incubated *in vitro* with or without biliverdin or bilirubin. The bile pigments greatly retarded oxidation of the vitamin. Their presence also reduced the rate of peroxide formation when emulsions of linoleic acid were shaken with air.

T. Moore.

4333

HIGH, E. G., WILSON, S. S., HAYWOOD, SMITH, C. (Jr.) and TAYLOR, H. H. Antioxidant studies concerned with the metabolism of carotene and vitamin A. *Federation Proc.*, 1954, **13**, 229. [Lab. Biochem. Res., Prairie View Agric. and Mech. Coll., Tex.] Experiments with rats.

4334

KAISER, E., FRANCIS, Y. F. and KAGAN, B. M. Vitamin A metabolism in nephrectomized rats. *Proc. Soc. Exp. Biol. Med.*, 1954, **85**, 457–458. [Kunstadter Labs. Paediat. Res., Michael Reese Hosp., Chicago, Ill.]

Both kidneys were removed from adult male albino rats, and others were subjected to a sham operation. Three hr. later vitamin A was estimated in the blood by Bessey's method. Some of the animals were then given an aqueous dispersion of vitamin A alcohol at the rate of 6000 I.U. per lb. bodyweight, and vitamin A was estimated in the blood 3 and 24 hr. later, after which the rats were killed and vitamin A was estimated in their livers. The removal of the kidneys had no effect on the concentration of vitamin A in the blood of untreated animals, or on the values found 4 or 24 hr. after giving vitamin A, or on the stores accumulated in the liver. The concentration of urea in the samples of blood taken 6 and 27 hr. after nephrectomy was high, but it did not rise after the sham operation.—T. Moore.

4335

OLSSON, N. Några synpunkter på hönsens A-vitaminförjning. [Some views on supplying

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vitamin A to poultry.] *Kgl. Lantbrukshögsk. Statens Husdjursförsök Särtryck* No. 101, 1953, pp. 8.
A review.

4336

SORENSEN, D. K., KOWALCZYK, T. and HENTGES, J. F. (Jr.) **Cerebrospinal fluid pressure of normal and vitamin A deficient swine as determined by a lumbar puncture method.** *Amer. J. Vet. Res.*, 1954, **15**, 258-260. [Dept. Vet. Sci., Univ. Wisconsin, Madison.]

Growing pigs, in which in the beginning the cerebrospinal fluid pressure ranged from 89 to 120 mm., were depleted of their reserves of vitamin A and were allotted to one of 4 groups. One group was given no supplement, and the others were given 10, 25 or 40 µg. carotene per kg. bodyweight daily. Before the supplements were given the cerebrospinal fluid pressure had risen to between 148 and 175 mm. At the end of the period with supplements the group given no supplement showed signs of severe deficiency and the cerebrospinal fluid pressure ranged from 212 to 220 mm. Pressure in the pigs receiving 10 µg. carotene rose to 160 mm. from about 152, but in the pigs receiving 25 or 40 µg. it fell by about 20 mm.

R. J. Ward.

4337

O'DONOGHUE, J. G. **Vitamin A deficiency in beef cattle in Alberta 1953.** *Canad. J. Comp. Med.*, 1954, **18**, 141-147. [Vet. Serv. Branch, Alberta Dept. Agric., Edmonton.]

Ten case histories of cows and sheep with presumed deficiency of vitamin A are presented [without corroborative evidence]. Most of the animals died; some that were treated responded to vitamin A. Inco-ordination and other abnormalities associated with the central nervous system were the most prominent signs. The affected animal was often found lying down with the neck extended, the head turned upwards, and the mouth dry; there might be running movements with the legs rigid, and spasms of the shoulder and neck muscles. In one there was acetonæmia. The animals had been reared on poor diets of such foodstuffs as oat straw, oat bundles, screenings or second-cut alfalfa hay.—I. M. Sharman.

4338

GERSHOFF, S. N., ANDRUS, S. B. and HEGSTED, D. M. **Vitamin A deficiency in cats.** *Federation Proc.*, 1954, **13**, 458. [Dept. Nutrit., Harvard Sch. Pub. Health, Boston, Mass.]

4339

LAMMING, G. E., SALISBURY, G. W., HAYS, R. L. and KENDALL, K. A. **The effect of incipient vitamin A deficiency on reproduction in the**
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rabbit. 1. Decidua, ova and fertilization. 2. Embryonic and fetal development. *J. Nutrition*, 1954, **52**, 217-225; 227-239. [Dept. Dairy Sci., Univ. Illinois, Urbana.]

1. Female rabbits were kept for about 3 months on a diet deficient in vitamin A, composed mainly of cereal products, with and without liberal supplements of carotene. Some of the rabbits in each group were then mated with vasectomised bucks. After 30 hr. the abdomen was opened and the formation of decidua was induced by insertion of a thread through the lumen of one horn of the uterus. When the animals were killed after another 36 hr., no difference in the formation of decidua was found between the groups, but the number of corpora lutea was less in the animals not given carotene. Others of the rabbits were mated with normal bucks and their fertilised ova were obtained for microscopical examination by flushing out the oviducts with warm saline 40 hr. or 4 days after copulation. Nearly all the ova from the animals given carotene were developing normally, but from 25 to 33 per cent. of those from the animals given the deficient diet showed premature degeneration. Throughout the experiments the rabbits all remained free from any signs of acute deficiency in the eyes and coat. Presence of the desired degree of incipient deficiency was, however, confirmed at autopsy by biochemical tests which showed traces only of vitamin A in the blood plasma and liver of the animals not given carotene.

2. Forty-two female rabbits were given diets lacking vitamin A. An equal number received the same diet with supplement of vitamin A or a commercial diet containing adequate amounts of carotene. The animals were mated, and were killed from 10 to 28 days later. Observation was made of the number of pregnancies, corpora lutea, living fetuses and resorption sites. Of the animals given the unsupplemented diet only 21 became pregnant, against 32 not deprived. The average number of corpora lutea was about the same for the deprived and non-deprived. The average number of living fetuses was greater in the non-deprived. Thus, in rabbits killed after from 16 to 28 days of pregnancy, those deprived had on the average 1.9 living fetuses and 3.3 resorption sites, against 6.1 and 0.5 sites for the deprived. In the deprived animals the eyes of the fetuses were sometimes abnormal, and the placenta had a mottled appearance. The pregnant rabbits appeared to be healthy even when given no supplement, but their reserves of vitamin A were low, as was shown by biochemical tests on the blood plasma and liver.—T. Moore.

4340

TEAGUE, H. S., CARPENTER, L. E. and WINTERS, L. M. **The effect of moderate states of**

vitamin A deficiency on reproductive performance in gilts. *J. Animal Sci.*, 1953, **12**, 955. *Proc.* [Univ. Minnesota.]

4341

PARRISH, D. B., AUBEL, C. E. and HUGHES, J. S. **The relative value of carotene in oil solution and in alfalfa meal and of the vitamin A-active carotenoids in yellow corn for supplying vitamin A for swine during gestation and lactation.** *J. Animal Sci.*, 1953, **12**, 926. *Proc.* [Kansas Agric. Exp. Stat.]

4342

BAKER, F. H., POPE, L. S. and MACVICAR, R. **Relative importance of dietary carotene and liver stores of carotene and vitamin A for reproduction and lactation of beef cows.** *J. Animal Sci.*, 1953, **12**, 906. *Proc.* [Oklahoma Agric. Exp. Stat.]

4343

CHURCH, D. C., MACVICAR, R., BIERI, J. G., BAKER, F. H. and POPE, L. S. **Utilization of intravenously-administered carotene in cattle and sheep.** *J. Animal Sci.*, 1953, **12**, 910-911. *Proc.* [Oklahoma Agric. Exp. Stat.]

4344

WATKINS, W. E. and KNOX, J. H. **A study of the supplemental feeding of carotene for range breeding cows during the precalving and calving period.** *J. Animal Sci.*, 1954, **13**, 490-495. [New Mexico Agric. Exp. Stat., State College.]

Fifty grade Herefords including aged cows and first-calving heifers were divided into 2 groups as evenly as possible. They were maintained on pasture in Southern New Mexico with an excellent stand of black grama, a grass known to retain its carotene content well during the winter. The tests were repeated each year from 1946 to 1953. From 4 weeks before calving each cow in the first group of 25 received 1 lb. cottonseed meal daily, the others 1½ lb. of a mixture of 23 parts dehydrated alfalfa meal, 70 parts cottonseed meal and 7 parts molasses. The energy and digestible protein of the supplements were about the same. Carotene was estimated in the alfalfa meal and samples of forage every 28 days. Blood samples taken on the same day from about 16 representative cows in each group were analysed for carotene and vitamin A. The first samples were taken about 15 March each year before calving and further samples were taken in April and May. Three values only for carotene in the forage were low, less than 6.4 mg. per lb.; they were not associated with low values for plasma carotene. The carotene in blood was usually low in March but rose as the

young pasture appeared. The plasma value for carotene in the group given cottonseed meal was above that found by other workers in cows and heifers producing normal calves. In the group given alfalfa meal it was not above that in the group given no extra carotene. The values for vitamin A in the blood of the 2 groups did not differ significantly.—I. M. Sharman.

4345

GALLUP, W. D., THOMAS, O. O., ROSS, O. B. and WHITEHAIR, C. K. **Carotene and vitamin A metabolism in cattle and sheep on phosphorus-deficient rations.** *J. Animal Sci.*, 1953, **12**, 715-721. [Oklahoma Agric. Exp. Stat.]

Yearling steers which had been depleted of their reserves of P and vitamin A were given a ration with a high or a low P content and a supplement of carotene equivalent to about 10 times the daily requirement. The steers receiving the low-P ration had consistently higher values for carotene in the plasma. At the time of slaughter the plasma of those having the low-P diet had on the average 119 µg. carotene per 100 ml., and those having the high-P diet had 76 µg. The respective plasma values for vitamin A were 17 and 22 µg. per 100 ml. The carotene and vitamin A values for the liver in the two groups were similar.

In a similar experiment with lambs, those having the low-P diet had higher values for vitamin A in the blood plasma throughout the experiment. At slaughter the values were 20.4 µg. per 100 ml. for those having the low-P diet and 18.2 for those having the high-P diet. The vitamin A content of the liver was 13.2 and 11.8 µg. per g., respectively.—R. J. Ward.

4346

CHERNUISHEVA, M. I. **A-avitaminoznyi gepatit ovets. [Vitamin A hepatitis (deficiency) in sheep.]** *Veterinariya*, 1953, **30**, No. 11, 33-35. [Vses. Inst. Eksp. Vet.]

During a particularly poor season when pastures dried up 300 out of 584 sheep died. The disease was shown to be hepatitis resulting from vitamin A deficiency. Analysis of the feeds showed almost complete absence of vitamin A.

W. Hughes.

4347

HANSEN, H. M., PORTER, G. H., JOHNSON, R. E., EATON, H. D., BEALL, G. and MOORE, L. A. **Effect of form of alfalfa when fed as the sole source of roughage to Guernsey cows on the carotenoid and vitamin A content of milk.** *J. Dairy Sci.*, 1954, **37**, 311-316. [Animal Indust. Dept., Storrs Agric. Exp. Stat.]

Guernsey cows were divided into 6 groups of 3. The 3 cows within a group were fed separately on

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one of 3 forms of alfalfa in an experiment of double change-over design. The 3 forms, artificially dried and chopped, artificially dried and pelleted, and field-cured and field-baled, were each given for 40 days. Their respective carotenoid contents were approximately 31, 28 and 4 mg. per lb., and the daily carotenoid intakes were 801, 717 and 96 mg. per cow. The content of the milk in μg . per 100 ml. was for carotenoids 61, 42 and 47, and for vitamin A 19.8, 16.2 and 17.2. The proportion of the carotenoid intake which entered the milk was greatest with the field-cured and field-baled alfalfa.

R. J. Ward.

4348

LALITHA, K. R. and DASTUR, N. N. **Keeping quality of ghee. 2. Effect of storing butter and ghee on vitamin A content.** *Indian J. Dairy Sci.*, 1954, 7, 1-7. [Indian Dairy Res. Inst., Bangalore.]

In the preparation of ghee considerable loss of vitamin A occurred at the butter stage. Butter prepared from fresh milk had after 6 days 5 or 6 per cent. free fatty acids and there was a loss of from 12.5 to 19.4 per cent. of its vitamin A. Part of the loss was prevented by using boiled milk and by washing the butter before storage. Butter stored under water or in a 2 per cent. salt solution took about 5 times as long to lose this proportion of vitamin A. Samples of ghee exposed to mild diffused light lost from 44.0 to 82.6 per cent. of their vitamin A content after from 14 to 24 days' storage. If stored in the dark at room temperature with a small air-gap, the loss of vitamin A was from 12.5 to 36.1 per cent. after 120 days, but if the temperature was increased to 42° C. the loss was between 72 and 100 per cent. after about 85 days. Both cow and buffalo butter and ghee were examined, but the results did not show any certain difference in their storage properties.

I. M. Sharman.

4349

SHROFF, N. B., NARAYANAN, K. M., ANANTAKRISHNAN, C. P. and SEN, K. C. **Studies on vitamin A in milk. 7. Effect of processing on the stability of vitamin A in fortified milk.** *Indian J. Dairy Sci.*, 1954, 7, 40-47. [Indian Dairy Res. Inst., Bangalore.]

Carotene and vitamin A are low in Indian milk, and fortification with synthetic vitamin A might well be beneficial. The effect of heat treatment on such added vitamin A was investigated. Portions of 6 samples of cow's and buffalo's milk were analysed for vitamin A and carotene before and after being pasteurised or boiled. Other portions of the same samples were fortified with vitamin A in fat-soluble and water-miscible form and were similarly investigated. Both carotene and vitamin A proved to be stable to the heat treatments. Cow's milk which averaged 2174 I.U.

vitamin A per lb. after fortification with 2739 I.U. fat-soluble vitamin A per 2550 ml. milk had values of 2165 and 2173 I.U. per lb. after pasteurisation and boiling, respectively. The average values of samples fortified with 5215 I.U. water-miscible vitamin A per 2550 ml. milk were 3178 before processing and 3172 and 3162 after. In other experiments the effect of the heat treatments on samples of skimmed milk, also fortified with water-miscible vitamin A, were investigated, and the vitamin was again found to be unaffected. In the process of khoa-making, however, 7.5 and 7.0 per cent., respectively, of the vitamin A and carotene content of whole milk disappeared. When milk fortified with both forms of vitamin A was used for this purpose the loss of the vitamin was about the same as when unfortified milk was employed. Throughout the experiments buffalo's milk behaved like cow's milk.—I. M. Sharman.

4350

ABDULLAH, M. M., MORCOS, S. R. and SALAH, M. K. **Content of vitamin A₂ in some Nile fishes.** *Biochem. J.*, 1954, 56, 569-571. [Dept. Biochem., Fac. Med., Univ. Alexandria.]

The liver oils of several different kinds of Nile fish were examined for vitamins A₁ and A₂ and neovitamin A₂. Estimations were made with the SbCl₃ reaction and by ultraviolet spectrophotometry after chromatography on weakened alumina. Neovitamin A₂ was estimated by the maleic anhydride method. Of the 15 fish examined only 2 contained appreciable amounts of vitamin A₁; their liver oil contained from 320 to 600, and 4000 μg . per g. Spectrophotometric examination showed that vitamin A₂ also was present. The other 13 liver oils gave ultraviolet spectra characteristic of vitamin A₂. Their potency ranged from 840 to 70,000 μg . per g. Six of the 13 contained the *neo* form in amounts ranging from 6.2 to 22.5 per cent.

R. J. Ward.

4351

MCCOLLUM, J. P. **Effects of light on the formation of carotenoids in tomato fruits.** *Food Res.*, 1954, 19, 182-189. [Dept. Hort., Coll. Agric., Univ. Illinois, Urbana.]

Green tomatoes exposed to sunlight often had a poor colour, owing to the low lycopene content caused by the high temperature. At a lower temperature light increased the amount of lycopene in tomatoes off the plant. Light had no further effect on the lycopene content after the chlorophyll had disappeared. The carotene content was increased by sunlight even at high temperatures. Chlorophyll in mature tomatoes stored in absence of oxygen and light failed to decompose. Decomposition in light but in absence of oxygen appeared to be brought about by the oxygen produced in photosynthesis.—V. H. Booth.

VITAMIN D

4352

WEI, L., PYKE, R. E. and PARRISH, D. B. **Ash content of chick beak for vitamin D assays.** *J. Agric. Food Chem.*, 1954, **2**, 568-569. [Kansas Agric. Exp. Stat., Manhattan.]

Chicks were prepared, fed, and selected, according to the A.O.A.C. (1950) method. In 7 trials, groups of from 6 to 27 chicks received for 12 or 21 days amounts graded from 0 to 25 I.C.U. vitamin D per 100 g. feed as the U.S.P. XIV reference oil. Ash was estimated separately in the "hard bone" of the upper beak [presumably the anterior part of the premaxilla], the bones of the lower beak cut at the root of the tongue, the tibia and the toe bones.

In the 21-day-test, in response to increasing dose, the upper and lower beak bones showed a slightly steeper rate of increase in the percentage ash than the tibia; both beak and tibia gave a more sensitive response than toes. Duplicate estimations gave satisfactory results. In the 12-day test, the responses were less well graded.

The beak is much easier to prepare than the tibia, and as it gave equally reliable results its use is recommended.—E. M. Hume.

4353

PATRICK, H. and SCHWEITZER, G. K. **Chick vitamin D assay method using radioactive calcium (Ca^{45}).** *Federation Proc.*, 1954, **13**, 472. [Univ. Tennessee, Knoxville.]

4354

NUMEROF, P., SASSAMAN, H. L., RODGERS, A. and SCHAEFER, A. E. **Bioassay of vitamin D with radiophosphorus.** *Federation Proc.*, 1954, **13**, 470-471. [E. R. Squibb and Sons, New Brunswick, N.J.]

4355

KANZAWA, T. and MIMA, H. **The chemical determination of vitamin D. 1. The antimony trichloride reaction and the separation of vitamin D from vitamin A. 2. The separation of vitamin D from sterols and determination of vitamin D in fish liver oils.** *Pharm. Bull. Japan*, 1953, **1**, 195-199; 199-202. [Res. Lab., Takeda Pharmaceutical Industries, Ltd., Osaka.]

1. The colour reaction of vitamin D_2 with Nield's SbCl_3 reagent was not affected by light or temperature. Vitamin D with some sterols was separated from vitamin A (2 types of the alcohol distinguishable in the elution curve) by liquid chromatography on alumina. Details of the procedure are given.

2. Details are given of the optimum conditions for digitonin precipitation of sterols from the vitamin D fraction. For certain fish liver oils the results of the chemical method gave good agreement with those of biological tests for vitamin D, no distinction being made between vitamin D_2 and vitamin D_3 .—K. H. Coward.

4356

KODICEK, E. and ASHBY, D. R. **Paper chromatography of vitamin D and other sterols. The estimation of vitamin D by paper chromatography.** *Biochem. J.*, 1954, **57**, xii-xiii; xiii. [Dunn Nutrit. Lab., Univ. Cambridge.]

4357

KANZAWA, T. and KOTAKU, S. **[Stability of vitamin D.]** *J. Pharm. Soc. Japan*, 1953, **73**, 1357-1360. [Res. Lab., Takeda Pharmaceutical Industries, Ltd., Osaka.]

Decomposition to the extent of 5 per cent. took place in crystals or alcoholic solutions of vitamin D_2 on standing in the light at room temperatures for one week. Decomposition proceeded more rapidly as time went on. Storage in brown bottles filled with an inactive gas, in an icebox, is recommended.—K. H. Coward.

4358

ROSS, E. and YACOWITZ, H. **Effect of penicillin on growth and bone ash of chicks fed different levels of vitamin D and phosphorus.** *Poultry Sci.*, 1954, **33**, 262-265. [Ohio State Univ., Columbus.]

Chicks were fed on a basal rachitogenic diet containing 0.33 per cent. inorganic P and 0.6 per cent. total P, with or without supplements of vitamin D and penicillin. In one experiment the inorganic P content was raised to 0.54 per cent. by the addition of defluorinated rock phosphate. In the absence of vitamin D, penicillin significantly improved growth when dietary P was high, but not when it was low. When the diet was supplemented with amounts of vitamin D greater than 4 I.U. per 100 g., penicillin significantly increased tibia ash. On a low-P ration, the percentage of fat in the tibia increased with increase in the amount of vitamin D given. With the lower amounts of vitamin D, penicillin had no consistent effect on the fat content of the tibia, but with the higher amounts, penicillin increased tibia fat.—E. M. Cruickshank.

4359

WEITS, J. **The antivitamin D factor in roughages.** *Netherlands J. Agric. Sci.*, 1954, **2**, 32-36.

N.A. and R., October 1954

[Lab. Animal Physiol., Agric. Univ. Coll., Wageningen.]

Vitamin D was separated from the rachitogenic substance in dry grass and hay by chromatography [no details]. Fractions of the unsaponifiable residue of the grass fat, with addition of fixed amounts of vitamin D, were tested on rachitic rats, with radiography of the bones as criterion, to ascertain the content of rachitogenic substance. A fraction was obtained which contained all the vitamin D but not the rachitogenic substance. The last was present chiefly in the carotene fraction; the fraction containing xanthophylls was inactive.

The method was applied to routine estimation of roughages. In hay dried in windrows or cocks or on tripods the vitamin D content ranged from 1005 to 1375 I.U. per kg., and there was little

increase after chromatography, showing the absence of rachitogenic substance. In artificially dried grass the values ranged from 270 to 1150 before chromatography, and from 595 to 1790 after it; the amount of rachitogenic substance was, therefore, considerable. The results were in accordance with the finding of Grant (Abst. 1730, Vol. 24), that carotene is the rachitogenic substance. The rachitogenic substance was not a phytosterol precipitable with digitonin.—E. M. Hume.

4360

THEOPOLD. Tierexperimentelle Untersuchungen über den Vitamin D-Gehalt ultraviolett-bestrahlter Milch. [Animal experiments on the vitamin D content of milk irradiated with ultraviolet light.] *Monatsschr. Kinderheilk.*, 1954, 102, 176-177. [Marburg.]

VITAMIN E

4361

SINGSSEN, E. P., MATTERSON, L. D., KOZEFF, A., BUNNELL, R. H. and JUNGHER, E. L. **Studies on encephalomalacia in the chick. 1. The influence of a vitamin E deficiency on the performance of breeding hens and their chicks.** *Poultry Sci.*, 1954, 33, 192-201. [Dept. Poultry Husb., Storrs Agric. Exp. Stat., Univ. Connecticut.]

During a preliminary period of 3 weeks, 6 groups of 25 Barred Plymouth Rock pullets received a basal ration low in vitamin E, and then for a further 9 months two groups received no supplement, two groups received an addition of 2 per cent. of a vitamin A and D oil [kind not stated], and two groups received B and other vitamins. One group in each pair of groups received 13.62 mg. α -tocopheryl acetate per lb. diet. Complete records of egg production, mortality, fertility and hatchability were kept.

Low values for tocopherol were found in the blood of birds whose diet was not supplemented with vitamin E; egg production and adult mortality were not affected, but the addition of tocopherol gave a highly significant increase in fertility. Histological examination of the brains of 21-day-old, pipped, embryos and day-old chicks revealed several with encephalomalacia. Chicks, hatched from the breeding hens without vitamin E and reared on a diet low in vitamin E with 2 per cent. of fish oil, regularly showed mortality rates between 33 and 67 per cent. Mortality was generally due to encephalomalacia and was prevented when tocopherol was added to the diet. Of 104 chicks with encephalomalacia, 67 were male and 37 female, a sex ratio of approximately 2 to 1. Addition of tocopherol to breeder diets with small amounts of vitamin A and D oil re-

duced mortality from encephalomalacia but did not entirely prevent it when the chicks were given the ration low in vitamin E with added oil. To secure the lowest rate of mortality it was necessary to add both tocopherol and a complex mixture of vitamins to the breeder diet.—I. M. Sharman.

4362

WEINSTOCK, I. M., SHOICHET, I. and MILHORAT, A. T. **Effect of vitamin E deficiency on oxidation of Krebs cycle intermediates by rabbit liver.** *Federation Proc.*, 1954, 13, 482. [Dept. Psychiat., Cornell Univ. Med. Coll., New York Hosp.]

4363

SIMON, E. J., GROSS, C. and MILHORAT, A. T. **Metabolism of C^{14} -D- α -tocopheryl succinate.** *Federation Proc.*, 1954, 13, 406. [Dept. Psychiat., Cornell Univ. Med. Coll., New York Hosp.]

4364

MILMAN, A. E., TREACY, A. M. and MILHORAT, A. T. **Pancreatic hyperglycemic factor on liver and muscle glycogen in vitamin E-deficient rabbits.** *Federation Proc.*, 1954, 13, 100-101. [Dept. Psychiat., Cornell Univ. Med. Coll., New York Hosp.]

4365

LEHR, D., CHURG, J. and MILORA, R. **Influence of alpha-tocopherol upon development of cardiovascular necrosis and hypertension in the rat.** *Proc. Soc. Exp. Biol. Med.*, 1954, 85, 615-624. [Dept. Physiol., New York Med. Coll., Flower and Fifth Avenue Hosp., New York.]

Ten-month-old rats were given a single massive intraperitoneal injection of sodium acetyl sulphathiazole, which caused acute kidney block. Groups were then kept on a basal diet which supplied daily 0.8 mg. tocopherol, or up to 20 mg. *dl*- α -tocopheryl acetate, mixed with the diet or given separately by stomach tube. During the next few weeks systolic blood pressure was recorded, and the organs of animals which died or were killed were examined histologically. The massive dose of tocopherol did not control the blood pressure or prevent the development of disseminated muscular necrosis. On the contrary, the tocopherol appeared to increase the severity of the lesions in the aorta, coronary arteries and stomach. Even in rats which had not been subjected to kidney block tocopherol caused moderate hypertension.—T. Moore.

4366

VISWANATHA, T., GANDER, J. E. and LIENER, I. E. **Interrelation of fat, carbohydrate and vitamin E in the diet of the growing rat.** *J. Nutrition*, 1954, **52**, 613–626. [Dept. Agric. Biochem., Univ. Minnesota, St. Paul.]

The growth-promoting properties of vegetable and animal fat, as represented by maize oil and butterfat, were compared in numerous complicated experiments with weanling rats. The carbohydrate component of the diet was sucrose or lactose, supplements of vitamin E were given or withheld, and in some groups a deficiency of vitamin E was induced by giving phthalylsulphathiazole, alone or in combination with tri-*o*-cresyl phosphate.

When a diet containing lactose was given without a supplement of vitamin E to weanlings of unknown dietary history, butterfat produced better growth than maize oil, but the difference disappeared when a daily supplement of 0.3 mg. α -tocopherol was given. When the diet contained sucrose growth was better than when it contained lactose, and no difference was apparent with change of the fat or with and without tocopherol.

Other rats were given diets without vitamin E and containing lactose or sucrose and either maize oil or hydrogenated vegetable oil, and vitamin E was estimated in the blood of animals killed at intervals up to 5 weeks. In the group given lactose and maize oil the value fell from 225 μ g. per 100 ml. after 1 week to 87 after 5 weeks; in the other groups the values after 5 weeks remained at from 310 to 370.

Young rats which had been depleted by feeding them for 2 weeks on a diet containing tri-*o*-cresyl phosphate and phthalylsulphathiazole grew better on a diet containing sucrose or lactose when given butterfat than when given maize oil. The inferior growth with maize oil and lactose could be brought nearer to the growth with butter-

fat by adding vitamin E; the better growth with sucrose was not influenced by vitamin E.

In young from mothers given a diet deficient in vitamin E, maize oil was more protective than butterfat against haemolysis in the test with dialuric acid, whether the diet contained lactose or sucrose. A daily supplement of 0.3 mg. vitamin E gave full protection, irrespective of the nature of the fat or carbohydrate.—T. Moore.

4367

FREY, J. and HOFFMANN, G. Untersuchungen am isolierten Warmblüterherzen über die Wirkung des *dl*- α -Tokopherol. [Studies with the isolated heart of warm-blooded animals of the effect of *dl*- α -tocopherol.] *Arch. exp. Pathol. Pharmacol.*, 1954, **221**, 477–481. [Klin. Med., Univ. Freiburg i. Br.]

The addition of sodium *dl*- α -tocopheryl phosphate to the Ringer solution used for perfusing isolated beating guineapig hearts had different effects according to the concentration. At from 1 to 5×10^{-7} the strength of the contractions, but not the frequency, was increased. There was no reduction in the circulation through the coronary system. At 1×10^{-6} the amplitude of the heart beat, its frequency and the coronary circulation were all reduced, and at 1×10^{-5} the heart stopped beating. With a concentration of 5×10^{-7} the preliminary increase in the amplitude of the heart beat was followed after 30 min. by a reduction, which indicated that the effect of the tocopherol was cumulative. Small doses of tocopherol constricted the coronary vessels in hearts which had stopped beating.—T. Moore.

4368

FREY, J. Über Stoffwechselwirkungen von α -Tokopherolen, im besonderen untersucht an der Niere. [Metabolic effects of α -tocopherols, in particular on the kidney.] *Arch. exp. Pathol. Pharmacol.*, 1954, **221**, 466–476. [Klin. Med., Univ. Freiburg i. Br.]

The respiration of slices of rat's kidney suspended in 0.85 per cent. saline was reduced by 20 per cent. by the addition of 5 mg. sodium-*dl*- α -tocopheryl phosphate per ml. With lower concentrations down to 0.5 μ g. per ml. graded reductions in respiration occurred. The tocopherol reduced respiration also in heart, muscle, brain and embryo, but in liver respiration was increased by 25 per cent., though it was partly or completely inhibited by larger amounts, 50 mg. per ml. or more. Pentamethyl-6-hydroxy-chroman phosphate had a similar action. Tocopherol decreased the tiring of frog's muscle as tested by electrical stimuli, and partly counteracted the toxicity of monoiodoacetic acid and cyanide.

In 3 human volunteers daily doses of from 170 to 200 mg. *dl*- α -tocopheryl acetate caused increases of from 10 to 57 per cent. in the volume of urine excreted. In a large group of mice daily injections of 10 mg. sodium tocopheryl phosphate per kg. bodyweight increased the volume of urine by 108 per cent., and the amounts of NaCl and urea excreted by 96 and 27 per cent., respectively; the sp. gr. of the urine was reduced. The effect of injections of sodium tocopheryl phosphate on the diuresis of mice which were given excess of water, orally or by injection, varied between individuals.

T. Moore.

4369

FREY, J. Über den Einfluss von *dl*- α -Tokopherol auf den fermentativen Phosphatstoffwechsel der Tubuluszellen der Rattenniere. [Effect of *dl*- α -tocopherol on fermentative phosphate metabolism of the tubule cells of the rat kidney.] *Arch. exp. Pathol. Pharmacol.*, 1954, **221**, 482-488. [Klin. Med., Univ. Freiburg i. Br.]

The respiration of slices of rat kidney cortex, and the production of ammonia by them, were decreased by the addition of sodium α -tocopheryl phosphate to the suspension. The phosphatase activity and adenosinetriphosphatase activity also of the homogenised tissues were decreased by sodium tocopheryl phosphate. Injection of 3 or 10 mg. of *dl*- α -tocopheryl acetate into rats daily for 4 or 5 days caused the adenosinetriphosphate content of the kidney cortex to be reduced by 21 or 40 per cent. and phosphocreatine to be reduced by 60 or 70 per cent.—T. Moore.

4370

SHARMAN, G. A. M. Muscular dystrophy of beef calves in the North of Scotland. *Vet. Rec.*, 1954, **66**, 275-279. [North of Scotland Coll. Agric., Inverness.]

A full description is given of a disease of suckled beef calves which occurs in the North of Scotland when housed cattle are first put to grass in early summer. It has been established that the disease is a muscular dystrophy, characterised clinically by bilaterally symmetrical stiffness, especially of the shoulder region. Sudden death may occur from degeneration of the myocardium. Some affected animals have difficulty in breathing, owing to dystrophy of the intercostal muscles or the diaphragm. The disease is variable in its incidence from year to year. Exercise appears to precipitate the appearance of signs.

The affected muscle fibres become swollen and more highly eosinophilic. Hyaline degeneration follows and the tissue becomes invaded by a mass of nuclei, perhaps of sarcolemmal origin. Such muscles have a low creatine content, and the liver tocopherol content is also low.

Roughly 60 per cent. of calves showing stiffness recover slowly without treatment if kept warm and confined. But treatment with α -tocopherol acetate by mouth, in doses of 600 mg. followed by 200 mg. daily, will induce recovery within a few days.

The disease can be prevented by ensuring that in-calf cows receive adequate amounts of vitamin E by mouth, or by giving calves this vitamin from birth. Grass is a good source of the vitamin, as are the kales and wet distiller's grains.

The anti-vitamin-E effect of unsaturated fatty acids appears to have been responsible for a few cases of the disease, which has been observed in bulls given cod liver oil.—W. A. Greig.

4371

SLINGER, S. J., PEPPER, W. F. and MOTZOK, I. Interrelationship between vitamin E and phosphorus in preventing perosis in turkeys. *J. Nutrition*, 1954, **52**, 395-403. [Dept. Poultry Husb., Ontario Agric. Coll., Guelph.]

Twelve groups of turkey chicks, each of 20 males and 20 females, were reared on starting and growing basal diets which included cereal products, soyameal, fishmeal, and meatmeal, manganese, and vitamins except for vitamin E. The total amount of inorganic P was adjusted to be 0.3, 0.5 or 0.7 per cent., and each proportion of P was given alone or with 0, 2.5, 5.0 or 7.5 I.U. *d*- α -tocopheryl acetate per lb. mash. The weight reached by the birds after 24 weeks was slightly greater with 0.5 or 0.7 per cent. P than with 0.3 per cent., but the amount of vitamin E did not affect growth. Perosis, shown by enlargement of the hock joints and bowing of the legs, was seen in males but not in females. The greatest incidence was 52.6 per cent. in the group given 0.3 per cent. P without vitamin E. Raising the percentage of P to 0.7 without giving vitamin E decreased the incidence of perosis to 23.8 per cent. A tocopherol allowance of 7.5 I.U. per lb. combined with 0.3 per cent. P reduced the incidence to 20 per cent. With 0.7 per cent. P and 5 or 7.5 I.U. vitamin E per lb. feed, perosis was prevented in all the birds. With the other combinations of P and tocopherol, there was intermediate incidence of perosis.

T. Moore.

VITAMIN K

4372

ANDERSON, G. C., HARE, J. H., BLETNER, J. K., WEAKLEY, C. E. (Jr.) and MASON, J. A. **A hemorrhagic condition in chicks fed simplified rations.** *Poultry Sci.*, 1954, **33**, 120-126. [Dept. Animal Husb., W. Virginia Agric. Exp. Stat., Morgantown.]

Chicks maintained on wire floors and given a ration of yellow maize, solvent-extracted soya bean meal, minerals, vitamins A and D, riboflavin and vitamin B₁₂ showed haemorrhages in the breast and leg muscles, in the brain, and subcutaneously in the wings and legs. The blood clotting time was prolonged. Inclusion in the diet of menadione, alfalfa meal or fresh or dried droppings reduced clotting time and mortality from haemorrhage. Inclusion in the diet of penicillin, sulphaquinoxaline or a commercial coccidiostat, or penicillin combined with any one of these, did not reduce the haemorrhages.—E. M. Cruickshank.

4373

SWEET, G. B., ROMOSER, G. L. and COMBS, G. F. **Further observations on the effect of sulphaquinoxaline, *p*-aminophenylarsonic acid, and oxytetracycline on blood clotting time of chicks.** *Poultry Sci.*, 1954, **33**, 430-432. [Dept. Poultry Husb., Univ. Maryland, College Park.]

Chicks were fed for 4 weeks on a basal ration containing no alfalfa meal or added vitamin K, with or without supplements of sulphaquinoxaline, *p*-aminophenylarsonic acid and oxytetracycline (terramycin) given separately or together. On the basal ration alone, blood clotting time was normal. Addition of 0.03 per cent. sulphaquinoxaline or 0.03 per cent. *p*-aminophenylarsonic acid or a combination of them with 0.02 per cent. oxytetracycline prolonged blood clotting time, but it was restored to normal by supplementing the diet with 1 or 5 per cent. dehydrated alfalfa or 0.36 mg. menadione per lb. Blood Ca was not affected by the drugs.—E. M. Cruickshank.

4374

HOSKIN, F. C. G., SPINKS, J. W. T. and JAKES, L. B. **Urinary excretion products of menadione (vitamin K₃).** *Canad. J. Biochem. Physiol.*, 1954, **32**, 240-250. [Dept. Chem., Univ. Saskatchewan, Saskatoon.]

Adult male albino rats received intramuscular injections per kg. bodyweight of from 3.8 to 11.0 mg. radio-active vitamin K₃ in sesame oil. Urine

was collected from 10 to 20 hr. after each injection; the radio-active products were separated by paper chromatography and identified by absorption spectra and chemical analysis.

From 20 to 40 per cent. of the administered radio-activity was excreted during the 20 hr., less than 10 per cent. in the following 20 hr. At least 2 products were detected. Incubation with glucuronidase showed that one was the diglucuronide; acid hydrolysis showed that the other was a mono-sulphate of vitamin K₃. The latter was not hydrolysed by arylsulphatase. The excretion of the 2 products increased with the amount of vitamin K₃ given. A third radio-active product was detected at the lower levels of dosage. It was easily hydrolysed. Glucuronic acid was not recovered; the findings for sulphate ion were indefinite. The excretion of the third radio-active product did not increase. Little or no vitamin K₃ as such was found in the urine.

The same products were found after administration of vitamin K₃ in the urine of an adult guinea-pig and of a rat that had received dicoumarol orally for 6 days.—V. R. Jackson.

4375

HINZ, C. F. and HARRIS, J. O. **The effect of certain vitamin K compounds upon the respiration of *Saccharomyces cerevisiae*.** *Arch. Biochem. Biophys.*, 1954, **48**, 261-266. [Dept. Bacteriol., Kansas Agric. Exp. Stat., Manhattan.]

The rate of respiration at 30° C. was estimated for young, active cells of *Saccharomyces cerevisiae* grown in a glucose medium with different amounts of vitamin K₃ (2-methyl-1:4-naphthaquinone) or its diphosphate or the K salt of vitamin K₅ (2-methyl-4-aminonaphthol hydrochloride). Vitamin K₃ as the phosphate had little effect on respiration, showing that the phosphate group was stable in the experimental conditions. Vitamin K₅ and vitamin K₃ inhibited respiration, the former more than the latter, which showed that the toxicity was not necessarily due to the unsaturated ketone structure of the latter. At higher concentrations of the vitamins, production of CO₂ was inhibited more than uptake of O₂.

With the Ca salt of fructose 1:6-diphosphate or Na pyruvate or ethanol as substrate, both vitamins inhibited uptake of O₂ and production of CO₂ in aerobic conditions. There was no evidence that any single enzymic change was affected by the inhibition.—V. R. Jackson.

VITAMIN B COMPLEX: GENERAL

4376

JONES, A., TAYLOR, M. P. and GORE, D. N. **The detection of the vitamins of the B group by means of small circular chromatograms.** *Chem. and Indust.*, 1954, No. 16, 461-462. [Beecham Research Laboratories, Ltd., Brookham Park, Betchworth, Surrey.]

Detection of nicotinic acid or nicotinamide or both in amounts as small as 0.01 μ g. was achieved by putting 0.005 ml. solution on a circular filter paper cut to fit a Petri dish, and leaving the chromatogram for 1 hr. according to the method of Giri and Rao (Abst. 1500, Vol. 22) with butanol and ammonia, or butanol and water, air drying and then placing the paper for 15 min. on the surface of nutrient agar seeded with *Lactobacillus arabinosus*. The plate was incubated at 30° or 37° C. for 4½ hr. or more to give well defined growth zones. The method has been applied to natural products and to mixed vitamin preparations.

V. R. Jackson.

4377

HEYNDRIKX, A. **Paper chromatography of choline and the vitamins B₁, B₂, niacin, and niacinamide. Preparation of radioactive choline acetate and study of its hydrolysis.** *J. Amer. Pharm. Assoc.*, 1953, 42, 680-681. [Coll. Pharm., Univ. Minnesota.]

With paper chromatography and *n*-propanol and HCl as solvent, vitamin B₁, riboflavin, nicotinic acid and nicotinamide (free or associated with choline) were separated qualitatively. A spot test for each is described.

Radio-active choline acetate was prepared. After 24 hr. of ordinary atmospheric interference, it was hydrolysed to the extent of 54 per cent. and, after 3 days, of nearly 61 per cent. It was completely hydrolysed in an aqueous medium within a few seconds.—K. H. Coward.

4378

SILIPRANDI, N., SILIPRANDI, D. and LIS, H. **Separation and determination of vitamin B₆ group (pyridoxine, pyridoxal, pyridoxamine, pyridoxal phosphate and pyridoxamine phosphate). Separation by paper electrophoresis of riboflavin (riboflavin, FMN and FAD) and of nicotinamide (nicotinamide, DPN and TPN) groups.** *Biochim. biophys. Acta*, 1954, 14, 212-218. [Inst. Biochem., Univ. Upsala.] French and German summaries.

Separation of the substances of the vitamin B₆ group was by electrophoresis and spraying with diazotised *p*-aminoacetophenone. The colour of the spots ranged from pink to yellow, and was

stable; there was no breakdown of the esters. Methods are described for making the estimation quantitative.

Riboflavin and its coenzymes were separated by the same methods of electrophoresis on paper. The spots were located by their bright yellow fluorescence in ultraviolet light.

Nicotinamide and its coenzymes also were separated; di- and triphosphopyridine nucleotides were converted to the dihydro-forms after electrophoresis, by spraying with Na₂S₂O₃ and NaHCO₃, when their spots showed a feeble fluorescence in ultraviolet light; nicotinamide and its compounds showed dark spots.

The three methods listed above could be applied to detection of all the substances in presence of one another. A "Mineral light" was used first; it showed all the spots and identified those due to riboflavin compounds by their yellow fluorescence; their specific reactions could then be applied to the vitamin B₆ and nicotinamide groups.

V. R. Jackson.

4379

REID, M. E. **Nutritional studies with the guinea pig. B-vitamins other than pantothenic acid.** *Proc. Soc. Exp. Biol. Med.*, 1954, 85, 547-550. [Lab. Biochem., Nat. Inst. Health, Pub. Health Serv., U.S. Dept. Health, Bethesda, Md.]

Groups of guineapigs from 2 to 4 days old received for 6 weeks a basal diet previously described by Reid and Briggs (Abst. 3515, Vol. 24) from which single vitamins were omitted.

The signs of deficiency of vitamins B₁ and B₆, choline and folic acid are described; weight gains and the numbers of survivors were less than in groups having the complete diet. Retardation of growth occurred when nicotinic acid or riboflavin was omitted, but there were no specific signs of deficiency. Some of the survivors grew well and might have lived indefinitely.

There was no significant difference in weight of groups receiving a complete diet or a diet without *p*-aminobenzoic acid, inositol, biotin or vitamin B₁₂, although it is thought that those vitamins were necessary for maximum growth. When only 3 μ g. folic acid were included per kg. diet, there was some response to *p*-aminobenzoic acid, but in the presence of 10 μ g. folic acid per kg. it had no effect.—V. R. Jackson.

4380

STOERK, H. C., KNOWLTON, A. I. and LOEB, E. N. **Failure of liver feeding to counteract cortisone effects other than growth inhibition.** *Proc.*

Soc. Exp. Biol. Med., 1954, **85**, 627-631.
[Merck Inst. Therap. Res., Rahway, N.J.]

Experiments on rats showed that liver powder added to the diet prevented the inhibition of growth by cortisone given orally, but had no effect when the cortisone was given subcutaneously. In adrenalectomised rats liver powder was ineffective whether the cortisone was given orally or parenterally. In intact rats not given liver powder the growth-inhibiting effect of cortisone was greater when it was given parenterally than orally. Liver powder had no effect on the hypertensive action of cortisone, or on the rise in blood sugar and liver glycogen which follows cortisone administration. Serum sodium studies suggested that the supplement of liver had no effect on the absorption of cortisone.—L. Wills.

4381

ALLISON, J. B., WANNEMACHER, R. W. (Jr.) and MIGLIARESE, J. F. **Diet and the metabolism of 2-aminofluorene.** *J. Nutrition*, 1954, **52**, 415-425. [Bur. Biol. Res., Rutgers Univ., New Brunswick, N.J.]

Dogs received diets with no protein, or with sufficient to maintain nitrogen equilibrium in a normal dog, or with high protein content, and with vitamins in amounts adequate for normal growth of young dogs. Riboflavin or pantothenate was omitted from some of the diets, and then given in increased amounts. All dogs received orally 30 mg. of the carcinogen 2-acetylaminofluorene or 2-aminofluorene per kg. bodyweight 2 and 1 week, respectively, before the end of the time on a given diet. Urine was collected for the 3 days after each treatment and diazotisable amines were estimated.

In the urine an acid- and ether-soluble amine, identified as 2-aminofluorene, and an ether-soluble conjugated amine, identified as 2-acetylaminofluorene, increased with the protein content of the diet. There was no change in the amount of ether- and alkali-soluble amine. The amount of water-soluble, heat-labile amines excreted decreased with increasing protein content; it was greater with the free amine, possibly owing to the greater toxicity of the latter. Excretion of free and conjugated amines increased with the content of riboflavin or pantothenate in the diet; reduction of the riboflavin and protein intake increased the heat-labile amine fraction. It is suggested that the protective effect of diets high in protein and vitamins may be due to their promoting oxidation of the carcinogens by the liver.

The tests showed that the degree of conjugation of amines could not be estimated from the degree of diazotisation before and after hydrolysis of urine.—V. R. Jackson.

4382

KIMBEL, K. H., HEISE, E. and KÖNIG, H. Untersuchungen über enterale Antibiose bei der Ratte. [Studies on intestinal antibiotics in the rat.] 1. Veränderungen der Glucosebelastungskurve. 1. **Changes in the glucose tolerance curve.**

HEISE, E. and KIMBEL, K. H. 2. Veränderungen der Haut und des Haarkleides. [2. **Changes in the skin and hair.**] *Ztschr. ges. exp. Med.*, 1954, **123**, 265-278; 326-331. [Med. Poliklin., Univ. Würzburg.]

1. After preliminary studies on rats of normal fasting values for blood sugar and response to a large dose of glucose, the effect was tested of giving terramycin, streptomycin or aureomycin in oral doses of 20 mg. daily. After 18 to 22 days' treatment, the blood sugar curve in response to administration of glucose was abnormally flat. Normal absorption of sugar was restored by administration of the vitamin B complex or of vitamin B₁₂ alone, but not of folic acid alone.

2. When administration of terramycin or aureomycin was continued for more than 20 days signs of vitamin deficiency appeared, including skin lesions on the ears, nose and tail and poor, staring fur; finally the skin lesions became very severe and some rats died. Oral doses of vitamin B complex produced some improvement but injection of pyridoxine alone gave the most satisfactory cure of the whole condition. Injection of vitamin B₁, riboflavin or vitamin B₁₂ caused little or no change, and with nicotinic acid alone the skin condition deteriorated.—A. M. Copping.

4383

KESLER, E. M. **Effect of terramycin fed to Holstein calves on growth, in-vitro cellulose digestion and B-vitamin synthesis.** *J. Animal Sci.*, 1954, **13**, 10-19. [Pennsylvania Agric. Exp. Stat.]

Healthy male Holstein calves aged from 1 to 4 days received a milk replacement diet described by Williams and Knodt (Abst. 1117, Vol. 20) with or without 2 g. crystalline terramycin per 100 lb. replacement diet. During the seventh week, half of the animals receiving terramycin had it removed from the diet and half of those not receiving the drug had it added to the diet. A group of controls received milk throughout the test. All calves were offered up to 5 lb. calf starter diet daily and hay to appetite. Samples of rumen contents were obtained after 6, 12 and 16 weeks. Estimations were made of vitamin B₁ and riboflavin and of cellulose digestive activity in an artificial rumen. Bodyweight and height at withers were measured at weekly intervals.

During the first 8 weeks the growth of the calves receiving terramycin or milk was signifi-

N.A. and R., October 1954

cantly greater than of those without terramycin. After 8 weeks there was no significant difference in growth rate between those with and without antibiotic. Administration of antibiotic after the seventh week to those previously without it had no effect on growth from 8 to 12 weeks but caused it to be fairly rapid from 12 to 16 weeks. Terramycin increased consumption of calf starter diet but not of hay.

There was no difference in the vitamin B₁ content of rumen fluid, but that of riboflavin was slightly higher in calves given terramycin at the start. When the terramycin was started at the seventh week it had no effect on the riboflavin concentration. Terramycin had no adverse effect on rumen synthesis of vitamin B₁ or riboflavin.

Cellulose digestion by rumen liquid in an artificial rumen was poorer for calves receiving terramycin, 24.2 per cent. compared with 67.4 per cent. for those without. Administration of terramycin by capsule for 3 days to calves previously without it significantly reduced the digestive power to 12.3 per cent. from 49.5; omission caused a return to the former state. The results provided evidence that the antibiotic inhibited the micro-organisms responsible for cellulose breakdown.—V. R. Jackson.

4384

HALL, G., CHENG, E. W. and BURROUGHS, W. **B-Vitamins and other factors stimulatory to cellulose digestion by washed suspensions of rumen microorganisms.** *J. Animal Sci.*, 1953, **12**, 918-919. *Proc.* [Iowa State Coll.]

4385

SCHENDEL, H. E. and JOHNSON, B. C. **Mechanism of action of antibiotics in 'sparing' B vitamins.** *Federation Proc.*, 1954, **13**, 476-477. [Div. Animal Nutrit., Univ. Illinois, Urbana.] Experiments with rats.

4386

WAHLSTROM, R. C. **The effect of antibiotics and B-vitamins on the growth of pigs fed different levels of protein.** *J. Animal Sci.*, 1953, **12**, 934-935. *Proc.* [S. Dakota State Coll.]

4387

CARPENTER, J. W., PEARSON, A. M., WALLACE, H. D., JACK, F. H. and MILICEVIC, M. **The content of B-complex vitamins in the tissues of pigs fed various levels of protein with and without aureomycin.** *J. Animal Sci.*, 1953, **12**, 900. *Proc.* [Florida Agric. Exp. Stat.]

4388

NEVIN, T. A. **The vitamin requirements of certain alpha-hemolytic streptococci isolated from the**

human mouth. *J. Bacteriol.*, 1954, **67**, 217-219. [Dept. Bacteriol., Med. Coll. Alabama, Birmingham.]

4389

BARNHART, C. E., CATRON, D. and CULBERTSON, C. C. **The effect of rations on selected vitamin content of sows' milk.** *J. Animal Sci.*, 1954, **13**, 375-382. [Dept. Animal Husb., Iowa Agric. Exp. Stat., Ames.]

Riboflavin, nicotinic acid and pantothenic acid were estimated microbiologically in milk from sows on the 2nd, 7th, 21st and 56th day of lactation. The sows were receiving all-vegetable or mixed animal and vegetable protein and, in some groups, supplements of alfalfa meal with or without extra meat scraps. Milk was readily obtained after injection of pituitrin or pitocin. Alfalfa meal increased the amount of all three vitamins in the milk but that of pantothenic acid was the only one significantly increased. Alfalfa meal and meat scraps caused a significant increase in the riboflavin content, but no significant increase in that of nicotinic acid or pantothenic acid.

A. M. Copping.

4390

LEE, F. A., BROOKS, R. F., PEARSON, A. M., MILLER, J. I. and WANDERSTOCK, J. J. **Effect of rate of freezing on pork quality. Appearance, palatability, and vitamin content.** *J. Amer. Dietetic Assoc.*, 1954, **30**, 351-354. [New York Agric. Exp. Stat., Cornell Univ., Geneva.]

Chops from *longissimus dorsi* muscles of 2 pig carcasses were frozen by plate contact at -50° F. for 1½ hr., or in a home freezer at 0° F. for 5½ hr., or in an insulated box in a home freezer at 0° F. for 19 hr. Samples were used immediately or after storage for 6 months at 0° F.

Samples were thawed and broiled to an internal temperature of 150° F. Total solids, ether extract, vitamin B₁, riboflavin, pantothenic acid and vitamin B₆ were estimated in three samples and in cooked unfrozen samples and in a raw frozen sample.

The rate of freezing and period of storage appeared to have no effect on the vitamin content. Vitamin B₆ was lower in the cooked samples. Differences in palatability, including flavour, appearance, odour, texture and juiciness, were not significant. Extremely slow freezing is not recommended, since the quality of the meat might be affected and changes due to micro-organisms could occur. To avoid such slow freezing, a large quantity of unfrozen packages should not be put at one time into a home freezer not adapted to deal with such quantities.—V. R. Jackson.

4391

JOSHI, S., MASTER, F. and MAGAR, N. G. Nutritive value of some Bombay fish. 1. Distribution of non-protein nitrogen extractives, and thiamin, riboflavin, and niacin. *Indian J. Med. Res.*, 1953, **41**, 431-439. [Dept. Biochem., Inst. Sci., Bombay 1.]

Vitamin B₁, riboflavin and nicotinic acid were estimated in the muscle of 24 species of Indian fish and in the livers and roes of 4 enzyme hydrolysis. Values for the vitamins were higher after than before acid hydrolysis. The results by acid hydrolysis were in general agreement with those of other workers and in $\mu\text{g. per g.}$ ranged from 0.1 to 1.1 for vitamin B₁, from 0.5 to 12.9 for riboflavin, and from 6.1 to 48.2 for nicotinic acid. Bombay duck was low in all the vitamins, but it is concluded that a liberal intake of fish would make a valuable contribution to the daily requirement.

In teleostean fishes N.P.N. was 10 to 11 per cent. of the protein N and in elasmobranchs 57 per cent. There was no difference between the 2 types in trimethylamine content. The rate of formation of trimethylamine depended on the species but was slowed by storage in the cold; degree of spoilage was comparable after 1 day at room temperature and 5 days at from 0° to 5° C.

Free amino-acids were detected by paper chromatography. Detailed tables are given.

V. R. Jackson.

4392

WATANABE, T. and GOTO, M. Minute constituents of crude drugs. 1. Folic acid in drugs used as

nutrients and tonics. 2. Vitamin B group in Japanese pollens and honeys. 3. On nicotinic acid and vitamin B₁₂ in drugs. *J. Pharm. Soc. Japan*, 1953, **73**, 419-421; 422-425; 841-844. [Res. Lab., Takeda Pharmaceutical Industries, Ltd., Osaka.]

1. The concentration of folic acid in dried spinach, estimated by the growth rate of *Streptococcus faecalis*, was greatest in the root, less in the mesophyll of the leaf and least in the petiole. Of the fresh tissue the mesophyll was richest, and the whole plant above ground was richer than the part below the surface. Folic acid was found also in a few tonic drugs.

2. Pantothenic acid was found in 8 kinds of pollen from various domestic plants, the mean value being 15.3 $\mu\text{g. per g.}$, and in 7 kinds of honey, mean value 1.15 $\mu\text{g. per g.}$ Nicotinic acid was found in pollens, mean value 180 $\mu\text{g. per g.}$, and in honeys, mean value 0.85 $\mu\text{g. per g.}$

3. The nicotinic acid content of extracts of several crude drugs was estimated microbiologically with *Lactobacillus arabinosus* as test organism. To test whether the response was in fact due to nicotinic acid, an extract of *Nuphar japonicum* was treated chromatographically and a growth of micro-organism was found in the fraction having the same R_F value as pure nicotinic acid. By the same method the presence of vitamin B₁₂ was proved in *Ligusticum acutilobum*, which may be of significance, since a crude drug from the plant is used for treating anaemia.—K. H. Coward.

VITAMIN B₁ (ANEURIN, THIAMINE)

4393

SOCIETY FOR ANALYTICAL CHEMISTRY, ANALYTICAL METHODS COMMITTEE. The microbiological determination of thiamine. *Analyst*, 1954, **79**, 118-121.

A report is submitted to the Society for Analytical Chemistry by its Sub-Committee on Vitamin Estimations. The two microbiological methods recommended were the plate-cup method of Jones and Morris (Abst. 3357, Vol. 19) and the tube method of Fitzgerald and Hughes (Abst. 3356, Vol. 19), both with *Lactobacillus fermenti*. Eight laboratories estimated vitamin B₁ by both methods in samples of national flour, wheat germ, dried yeast and vitamin tablets; from the results recommendations are made on the use of the methods and their limitations. It is concluded that an accuracy of ± 12.5 per cent. could be obtained by an analyst experienced in microbiological technique.

V. R. Jackson.

4394

SILIPRANDI, D. and SILIPRANDI, N. Separation and quantitative determination of thiamine and

thiamine phosphoric esters and their preparation in pure form. *Biochem. biophys. Acta*, 1954, **14**, 52-61. [Inst. Biochem., Univ. Upsala.] French and German summaries.

A mixture of vitamin B₁ and its mono-, di- and triphosphoric esters was prepared by the method of Viscontini *et al.* (Abst. 3397, Vol. 21). Good separation of small amounts was obtained by ascending paper chromatography. Larger amounts were separated by chromatography on a starch column, with final separation on an ion-exchange resin.

Complete separation with no breakdown of esters was obtained by electrophoresis on paper with acetate buffer. Satisfactory separation was obtained by electrophoresis on starch or cellulose powder columns; with starch part of the separation was brought about by adsorption and not by electrophoresis. Mould growth was prevented by toluene.

Paper chromatography and electrophoresis could be used for separating amounts of from 10 to 100 $\mu\text{g.}$ mixture, but only the latter for amounts up to 2 mg.

Pure di- and triphosphates of vitamin B₁ were prepared and in the pH range from 2 to 6 were stable after 5 days at room temperature. The enzymic activity as cocarboxylase when coupled with yeast apocarboxylase was tested manometrically, and was greater than that of a commercial product.—V. R. Jackson.

4395

WATANABE, A., FUGIWARA, H. and YOSHIDA, T. [Sources of variation in determination of vitamin B₁. 1. Fluorimetric method. 2. Formalin-azo method. 3. Comparison of the errors in vitamin B₁ assay.] *J. Pharm. Soc. Japan*, 1953, **73**, 1272-1277; 1278-1281; 1281-1283. [Res. Lab., Takeda Pharmaceutical Industries, Ltd., Osaka.] English summary.

1. No exact information or conclusion is given. "Procedures and errors in this determination method were theoretically made clear."

2. The formalin-azo method gave an error of only ± 1.7 per cent. and had the advantage that it needed no strict control of the reagents used.

3. "The order in which the less error occurred were ultraviolet absorption measurements, formaldehyde-azo, cyanogen-bromide and ferri-cyanide methods."—K. H. Coward.

4396

SOMOGYI, J. C. A spectrophotometric method for the determination of changes in the thiamine molecule. *Biochem. J.*, 1954, **56**, xl. [Physiol. Inst., Univ. Berne.]

4397

DE LANGE, P. and VAN DER MIJLL DEKKER, L. P. A browning reaction between thiamine and glucose. *Nature*, 1954, **173**, 1040-1041. [Central Inst. Nutrit. Res. T.N.O., Utrecht.]

A mixture of equal parts of glucose and vitamin B₁, with a moisture content of 1.5 per cent., was placed in amounts of 0.025 g. in 10 sealed tubes. The tubes were kept at 85° C., one being removed each day and stored at room temperature until all had been treated. There was considerable browning of the mixture during heating. With prolonged heating the amount of both components decreased significantly; colour and fluorescence increased. A solution of the mixture did not brown when heated for 10 days at 85° C.; the reaction occurred only at a low moisture content. A similar test in which arabinose replaced glucose gave greater browning, showing that the rate of reaction was affected by the aldose present; both components were destroyed more rapidly but the degree of fluorescence was about the same.

Spectrophotometric examination of the glucose and vitamin mixture showed that absorption due to glucose was completely suppressed; that of

vitamin B₁ remained unchanged even after 10 days' heat treatment. The adsorption curve showed formation of hydroxymethylfurfural as a result of glucose breakdown.

It is considered that the reaction may contribute to the non-enzymic browning of processed foods and may explain part of the loss of vitamin B₁ in foods treated by heat.—V. R. Jackson.

4398

WAIBEL, P. E., BIRD, H. R. and BAUMANN, C. A. Effects of salts on the instability of thiamine in purified chick diets. *J. Nutrition*, 1954, **52**, 273-283. [Dept. Biochem., Coll. Agric., Univ. Wisconsin, Madison.]

A basal diet for chicks was prepared from purified materials including synthetic vitamins and 6 per cent. of the salt mixture of Briggs *et al.* (Abst. 1140, Vol. 13). For some, glycerol replaced equivalent amounts of sucrose. Vitamin B₁ was incorporated as its chloride hydrochloride or its mononitrate. The diet was stored at known humidities and moisture contents. Vitamin B₁ was estimated by the thiochrome method immediately after the diet was mixed and at intervals afterwards.

When the salt mixture was omitted from the diet, recovery of vitamin B₁ was complete. Its presence caused instability of vitamin B₁ chloride hydrochloride, which was increased by fine milling of the salts. The most destructive components of the mixture were K₂HPO₄ and CaCO₃, and the vitamin was relatively stable if they were replaced by Ca₃(PO₄)₂ and KCl. After 1 week's storage, diets containing 8 per cent. of the unmodified and modified mixtures, respectively, retained 27 and 94 per cent. of the original vitamin B₁. Growth of chicks with the modified mixture was not, however, so satisfactory. MnSO₄ had a destructive effect, which was somewhat delayed.

Vitamin B₁ mononitrate appeared somewhat more stable than the chloride hydrochloride in diets with the unmodified salt mixture, but the composition of the salt mixture was of greater importance. Glycerol was effective as a stabiliser for both forms of the vitamin. The chemical results were confirmed by growth tests with chicks.

The destruction of both forms was retarded by moisture and the addition of 1 per cent. glycerol gave more protection in a dry than in a moist atmosphere. Ascorbic acid appeared to have a slight protective effect in dry diets, but promoted destruction in moist diets.—V. R. Jackson.

4399

NELSON, M. M. and EVANS, H. M. Effect of thiamine deficiency on reproduction in the rat. *Federation Proc.*, 1954, **13**, 470. [Inst. Exp. Biol., Univ. California, Berkeley.]

4400

WORDEN, A. N., WATERHOUSE, C. E. and PARTINGTON, H. **The utilisation and excretion of vitamin B₁ by the dog.** *Vet. Rec.*, 1954, **66**, 169-174. [Cromwell House, Huntingdon.]

Three dogs of different breed, sex and body-weight were maintained on a standard diet of rabbit, wholemeal bread and milk, with a known intake of water and vitamin B₁. Urine was collected for consecutive 24-hr. periods and vitamin B₁ was estimated. The food intake was the same for an active 19-lb. dog and a lethargic dog of 54 lb.; excretion of vitamin B₁ was not proportional to their bodyweight. The more active dog normally used about twice the amount of vitamin per unit of bodyweight, but when its activity was reduced, the amount excreted was similar to that of the other dog. When the water intake was increased the concentration of vitamin B₁ in the urine decreased and the total daily output remained the same. When the water intake was maintained at the higher level and the environmental temperature was raised by 30° F., the urine volume dropped to one-third, the concentration of vitamin B₁ increased, and the daily loss of the vitamin was significantly reduced.

In the third dog of intermediate weight with a lower food intake, the concentration of vitamin B₁ in the urine remained nearly constant, so that the daily output fluctuated with the urine volume. At the higher temperature loss of vitamin B₁ was just over half that at the lower temperature.

V. R. Jackson.

4401

CONRAD, H. R. and HIBBS, J. W. **A high roughage system for raising calves based on early rumen development. 4. Synthesis of thiamine and riboflavin in the rumen as influenced by the ratio of hay to grain fed and initiation of dry feed consumption.** *J. Dairy Sci.*, 1954, **37**, 512-522. [Dept. Dairy Sci., Ohio Agric. Exp. Stat., Wooster.]

Riboflavin was estimated microbiologically and vitamin B₁ by the thiochrome method in rumen samples collected three times daily and in urine collected over 24 hr. from young dairy calves receiving diets with differing proportions of hay and grain and with different types of hay. Cud inoculations into the rumen to establish adult rumen flora early were given weekly for 6 weeks.

Strained rumen liquor contained 4 to 8 times as much vitamin B₁ and riboflavin as an equal weight of diet, indicating microbial synthesis. When alfalfa or clover and timothy hay was given the different ratios of hay to grain had no effect on the synthesis of vitamin B₁ or riboflavin. Urinary excretion was the same in each group. An abrupt change from high-grain to high-roughage diets caused loss of weight for 2 to 4 weeks and synthesis

of vitamin B₁ decreased steeply; calves receiving high-roughage diets from birth had optimum synthesis of vitamin B₁.

In a further test calves received mature timothy hay alone or with a grain concentrate in amounts up to as much as the calves would consume. Vitamin B₁ was synthesised at the highest rate when the ratio of hay to grain was 4:1 and decreased significantly for other ratios. Riboflavin synthesis increased with increased grain up to a ratio of hay to grain of 2:1. A marked increase in the vitamin B₁ and riboflavin content of rumen liquor occurred when dry feed containing clover and timothy hay was given to calves that had received no dry feed up to 13 days. This suggested that the dry feed was a major stimulant in vitamin synthesis. Microscopic examination of different rumen samples by the method of Pounden and Hibbs (Abst. 624, Vol. 19) showed that the number of organisms was higher when the ratio of hay to grain was 4:1. When the ratio was 2:3 several organisms present in mature cattle were absent.

It was concluded that the synthesis of vitamin B₁ and riboflavin in the rumen was favoured by a feed containing a high content of roughage which, among other factors, promoted the growth of desirable micro-organisms.—V. R. Jackson.

4402

CASTER, W. O., MICKELSEN, O. and KEYS, A. **The determination of pyramin.** *J. Lab. Clin. Med.*, 1954, **43**, 469-474. [Lab. Physiol. Hyg., Univ. Minnesota, Minneapolis.]

Measurement of the amount excreted in the urine of the pyrimidine metabolite, pyramin, which occurs from the breakdown of vitamin B₁, was found to be a useful index of vitamin B₁ metabolism (Abst. 2481, Vol. 17); an accurate method of estimating it was, therefore, desirable. A fermentation method was evolved, with Fleischmann's baker's yeast in a fermentometer having specially constructed gas burettes. With 2-methyl-4-amino-5-ethoxymethylpyrimidine hydrochloride, a standard curve was constructed from which pyramin values could be calculated. It was possible to obtain reproducible results with fairly low intakes of vitamin B₁. In rats given autoclaved mixtures, the presence of heat degradation products of vitamin B₁ in the diet interfered with the measurement of pyramin excretion. Such products are, however, considered unlikely to occur in considerable amount in human diets.

A. M. Copping.

4403

ERSHOFF, B. H., GEIGER, E., BITTNER, E. and GRAHAM, T. **Comparative effects of glucose, fructose and sucrose on the thiamine requirement of the rat.** *Exp. Med. Surg.*, 1953, **11**,

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293-296. [Emory W. Thurston Labs., Los Angeles, Calif.] French and German summaries.

Weanling rats were given purified diets with or without vitamin B₁ and with glucose, fructose or sucrose as carbohydrate. When vitamin B₁ was present in the diet the rats grew equally well on all three sugars. When the diet lacked vitamin B₁ all the rats gained weight slowly for about 3 weeks and then gradually deteriorated and died. The average survival time ranged from 38 to 46 days but there was no significant difference attributable to the nature of the sugar in the diet.

A. M. Copping.

4404

APTEKAR, S. G. Vliyanie sootnosheniya belkov, zhirov i uglevodov v pishche na razvitie tiaminovogo avitaminoza. [Influence of the proportion of protein, fat and carbohydrate in the diet on the development of vitamin B₁ deficiency.] *Vop. Pitan.*, 1954, **13**, No. 2, 25-30. [Lab. Eksp. Patol., Inst. Pitan., Akad. Med. Nauk SSSR.]

Male rats of from 80 to 90 g. in groups of 12 were fed on diets of starch, casein and lard with salt and vitamin supplements, in which the calories were supplied, per cent., by casein 18, starch 75, and lard 7, or casein 75, starch 18 and lard 7, or casein 18, starch 7 and lard 75. After 2 weeks vitamin B₁ was withdrawn and the clinical condition, weight, pulse rate and urinary pyruvic acid were recorded. Animals having the high-casein and high-starch diets developed signs of vitamin B₁ deficiency equally quickly; the high-fat diet clearly inhibited the development of deficiency.

D. W. Taylor.

4405

MONFOORT, C. H. Restoration of acetoin and succinic semialdehyde formation in pigeon muscle homogenates impaired by thiamine deficiency. *Biochim. biophys. Acta*, 1954, **14**, 291-292. [Lab. Physiol. Chem., Univ. Utrecht.]

It had previously been reported (Abst. 321, Title 1575, Vol. 23) that formation of acetoin and succinic semialdehyde from pyruvate and ketoglutarate *in vitro* was decreased in homogenates of muscle from pigeons deprived of vitamin B₁. It is now shown that addition of vitamin B₁ pyrophosphate to the system *in vitro* restored the capacity to form acetoin and succinic semialdehyde.—E. M. Hume.

4406

FRANKEN, J. F. and STAPERT, F. P. Restoration of pyruvate breakdown in pigeon muscle homogenates impaired by thiamine deficiency. *Biochem. biophys. Acta*, 1954, **14**, 293-294. [Lab. Physiol. Chem., Univ. Utrecht.]

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The oxidation *in vitro* of pyruvic acid to acetoin with K ferricyanide or molecular oxygen as electron acceptor was impaired in homogenates of breast muscle from pigeons deprived of vitamin B₁. Oxidation by ferricyanide but not by oxygen was restored to normal by addition of vitamin B₁ pyrophosphate. A supernatant fraction obtained by centrifuging a homogenate of normal breast muscle was more effective than vitamin B₁ pyrophosphate, and both together had more effect than either alone.—V. R. Jackson.

4407

SALEM, H. M. Glyoxalase and methylglyoxal in thiamine-deficient rats. *Biochem. J.*, 1954, **57**, 227-230. [Dept. Biochem., Fac. Agric., Univ. Cairo.]

Adult and weanling albino rats received a synthetic diet without vitamin B₁. Signs of severe deficiency appeared after from 3 to 5 weeks. Other groups received a normal diet with vitamin B₁. Methylglyoxal was estimated by the author's modification of Woodward's method (*J. Biol. Chem.*, 1935, **109**, 1).

Methylglyoxal was present in the urine of the deprived but not of the normal rats. On administration of vitamin B₁ to the deprived rats, methylglyoxal disappeared and recovery was complete within a week.

In extracts from the livers of deprived rats, glyoxalase activity on substrates of methylglyoxal or phenylglyoxal was very low; normal activity was regained after administration of vitamin B₁.

Suspensions of the livers from deprived rats, or from normal rats in which glyoxalase was inhibited by kidney antiglyoxalase, produced methylglyoxal from a hexose diphosphate substrate. Methylglyoxal was not produced by the livers of normal animals or of those which had recovered from vitamin B₁ deficiency.

It is concluded that methylglyoxal does not accumulate in the liver of the normal rat because glyoxalase converts it to lactic acid.

V. R. Jackson.

4408

DE CARO, L., RINDI, G. and GRANA, E. Metabolic effects of neopyrithiamine and the aneurin contents in the tissues of the rat. *Experientia*, 1954, **10**, 140-141. [Inst. Human Physiol., Univ. Pavia.] Italian summary.

Earlier work (Abst. 1572, Vol. 23) showed that blood pyruvate rose, and the R.Q. and energy expenditure fell, by similar proportions in rats receiving neopyrithiamine or a diet deficient in vitamin B₁. Isolated diaphragm muscle from rats receiving the antivitamin had little glycogen and the onset of fatigue was rapid.

After oral administration of glucose, the R.Q. and metabolic rate rose in the rats on the deficient

diet but not in those given the antivitamin. Comparison of tissues showed that neopyrithiamine reduced vitamin B₁ in muscle, liver and brain to concentrations corresponding with deficiencies of from 5 to 10, 10 and 23 days' duration, respectively. The failure to utilise carbohydrates appeared to be related to the low vitamin B₁ content of nerve tissue.—V. R. Jackson.

4409

NABER, E. C., CRAVENS, W. W., BAUMANN, C. A. and BIRD, H. R. **Effect of thiamine analogs on embryonic development and growth of the chick.** *Federation Proc.*, 1954, **13**, 469-470. [Dept. Biochem., Univ. Wisconsin, Madison.]

4410

EICH, S. and CERECEDO, L. R. **Studies on thiamine analogues. 3. Effects on enzyme systems.** *J. Biol. Chem.*, 1954, **207**, 295-303. [Dept. Biochem., Fordham Univ., New York.]

With a preparation of α -carboxylase obtained from wheat germ by the method of Singer and Pensky (*J. Biol. Chem.*, 1952, **196**, 375), and with vitamin B₁ phosphorylase prepared from rat liver, the effects were studied of some vitamin B₁ analogues on pyruvate decarboxylation, acetyl-methylcarbinol formation and vitamin B₁ phosphorylation. Manometric methods were used to measure decarboxylation and phosphorylation, and photocolormetry for formation of acetylmethylcarbinol. Oxythiamine diphosphate inhibited carboxylase activity, but the extent of the inhibition depended on the order in which the reactants were added to the enzyme. Oxythiamine and neopyrithiamine had no effect on decarboxylation of pyruvate, and oxythiamine had no effect on formation of acetylmethylcarbinol. Neopyrithiamine very strongly inhibited vitamin B₁ phosphorylase, but oxythiamine had no effect. The nature of the inhibitory effects of vitamin B₁ analogues is discussed with consideration of the possible part played by phosphorylation of the analogues.—A. M. Copping.

4411

FUJIIWARA, M. and MATUI, K. **Anti-thiamine factors of the fern.** *J. Biochem., Tokyo*, 1953,

40, 427-434. [Dept. Hyg., Fac. Med., Univ. Kyoto.]

Bracken fern, *Pteridium aquilinum*, is eaten by human beings in Japan.

An aqueous extract of fern was incubated with vitamin B₁ for 30° C. at pH from 3 to 9. At pH 8 destruction of the vitamin was complete, and at pH 6 almost complete. After the extract had been boiled for 30 min. inactivation of vitamin B₁ was complete at pH 8 but did not occur at pH 6. When incubation was in an atmosphere of N₂, there was some degree of inactivation with raw and boiled extract, but it was less than in air. The fraction active at pH 6 did not pass through a cellophane membrane in distilled water but the fraction active at pH 8 did. Presence of pyridine accelerated inactivation by the fraction active at pH 6 but had no effect on that active at pH 8.

E. M. Hume.

4412

WOLFSON, S. K. (Jr.) and ELLIS, S. **Thiamine: toxicity and ganglionic blockade.** *Federation Proc.*, 1954, **13**, 418. [Dept. Pharmacol., Sch. Med., Temple Univ., Philadelphia, Pa.]

4413

VAN DER MIJLL DEKKER, L. P. and DE MIRANDA, H. **The vitamin B₁ content of Dutch wheat and the factors which determine this content.** *Netherlands J. Agric. Sci.*, 1954, **2**, 27-31. [Central Inst. Nutrit. Res. T.N.O., Utrecht.]

Vitamin B₁ was estimated colorimetrically by the method of van der Mijll Dekker (*Chem. Weekblad*, 1947, **43**, 532) in 10 Dutch winter and summer wheats grown for 3 years, 1946-48, on sea clay, sandy sea silt, river clay and sand.

Summer wheats varied widely, Van Hoek was high and Koga low. Summer wheat grown on sea clay or sandy sea silt had more than the same varieties grown on river clay or sand. All varieties were richer in 1947 with a warmer, drier summer than in 1946 or 1948. High content tended to be associated with late seeding date.

Among winter wheats, Alba had significantly more than Carstens V. Clay soils gave higher values than sandy soils. Weather conditions affected the vitamin B₁ content, but not as much as for summer wheat and not on silt soils. Seeding date had no influence.—V. R. Jackson.

RIBOFLAVIN

4144

FARRER, K. T. H. and MACEWAN, J. L. **The thermal destruction of riboflavin.** *Austral. J. Biol. Sci.*, 1954, **7**, 73-84. [Res. Labs., Kraft Foods, Ltd., Melbourne.]

Riboflavin solutions containing 5 μ g. per ml. in

several buffers were made up with pH values from 0.5 to 12.

In recovery tests the range of pH values for complete stability at 120° C. was from 2.0 to 5.0; at pH 8 destruction was complete. At lower temperatures the range was from 1.7 to 5.5 to 100° C., and from

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1.3 to 6.5 at 80°C. The tests at very low pH values showed that loss of riboflavin was due to reversible reduction, not to hydrolysis, and that by aeration before or after heating almost complete recovery was obtained.

The thermal destruction of riboflavin at the higher pH values was a first order kinetic reaction. Above the neutral point the rate of destruction was greatly affected by the buffer anions. The Arrhenius equation relating the constant of the rate of destruction to the temperature was followed closely. The rate was affected also by the concentration of riboflavin, and tests with solutions containing 5, 50 and 500 µg. per ml. showed that the equation relating the constant to logarithm of concentration was linear.

The degradation products of riboflavin were shown by chromatography to be ammonia, urea, 1:2-dihydro-6:7-dimethyl-2-keto-1-D-ribityl-3-quinoxalinecarboxylic acid, and an unidentified compound which gave a weak mauve fluorescence in ultraviolet light. A lumichrome with bluish white fluorescence appeared at the beginning of hydrolysis.—V. R. Jackson.

4415

PATTON, S. **The mechanism of sunlight flavor formation in milk with special reference to methionine and riboflavin.** *J. Dairy Sci.*, 1954, **37**, 446-452. [Dept. Dairy Husb., Pennsylvania Agric. Exp. Stat., State College.]

Samples of freshly pasteurised, skimmed milk in flint glass bottles were exposed for 1 hr. to sunlight. Comparable samples were kept in the dark. The strength and type of sunlight flavour were judged by observers familiar with it. When methional (β-methylmercaptopropionaldehyde) was added to skimmed milk in amounts ranging from 0.05 to 2.0 p.p.m., sunlight flavour was reproduced strongly with 0.2 p.p.m., and detectably with 0.05. Other compounds closely related to methional were tested and produced similar flavours but not typical sunlight flavour. The recovery and identification of methional from milk was not attempted, but the formation of methional was demonstrated when 100 mg. riboflavin and 3.0 g. methionine in solution in a quart bottle were exposed to sunlight for 3 hr. From an ether extract of the solution after saturation with NaCl, a 2:4-dinitrophenylhydrazone was prepared with an infrared absorption spectrum identical with that of a similar derivative prepared from pure methional.

Sunlight flavour was not formed with amino-acids other than methionine. In the presence but not in the absence of riboflavin, casein and whey proteins gave sunlight flavour and, of the whey proteins, pseudoglobulin appeared to be most

potent. Casein is, however, considered to be the more important source, since it is in greater concentration, has a higher content of methionine and is the principal component limiting transmission of light.

Results of other investigators and the role of riboflavin and other compounds in photolysis of methionine are discussed.—V. R. Jackson.

4416

GIRI, K. V. and KRISHNASWAMY, P. R. **Studies on the synthesis of riboflavin by a mutant yeast, *Saccharomyces cerevisiae*.** *J. Bacteriol.*, 1954, **67**, 309-313. [Dept. Biochem., Indian Inst. Sci., Bangalore.]

From a bottom strain of brewer's yeast, a mutant top strain of *Saccharomyces cerevisiae* was obtained which was capable of excreting large amounts of riboflavin. The yeast was maintained on wort agar slopes, and transferred to a basal medium on which its requirements for producing riboflavin were studied.

Shaking reduced the yield and, for an adequate supply of air, a large surface was needed on which the culture grew in a thin layer.

Presence of adenine, guanine, xanthine, hypoxanthine, thymine or uracil increased the production of riboflavin, but did not increase growth; all the substances had an optimum concentration above which they had no further effect. Adenine had the greatest effect, thymine and uracil the least. Uric acid inhibited riboflavin production.

Presence of tryptophan, phenylalanine or serine inhibited growth and riboflavin production. Methionine, glycine and arginine increased both, the two first having a greater effect on production of the vitamin.—V. R. Jackson.

4417

PLAUT, G. W. E. and BROBERG, P. L. **Biosynthesis of the aromatic and ribityl portions of riboflavin.** *Federation Proc.*, 1954, **13**, 274. [Enzyme Res. Inst., Univ. Wisconsin, Madison.]

4418

SALZBERG, D. A. **Vitamin B₂ activity of an azo dye carcinogen for a riboflavin-deficient *Neurospora* mutant.** *Proc. Amer. Soc. Cancer Res.*, 1954, **1**, 41-42. [Palo Alto Med. Res. Found., Palo Alto, Calif.]

4419

BURGESS, L. E., STEWART, J. O. and ROLFE, D. T. **Riboflavin-like effect of a pteridine on growth of certain microorganisms.** *Federation Proc.*, 1954, **13**, 20. [Dept. Physiol., Meharry Med. Coll., Nashville, Tenn.]



4420

KAUNITZ, H., WIESINGER, H., BLODI, F. C., JOHNSON, R. E. and SLANETZ, C. A. **Relation of protein and fat intake to growth and corneal vascularization in galactoflavin-produced ariboflavinosis.** *J. Nutrition*, 1954, **52**, 467-482. [Dept. Pathol., Inst. Ophthalmol., Coll. Phys. Surg., Columbia Univ., N.Y.]

Weanling rats received purified basal diets of varying casein and fat content with or without riboflavin and with or without galactoflavin. Growth and food consumption were recorded and the eyes were examined by slit lamp after dilatation of the pupils with homatropine.

With high riboflavin and 20 per cent. lard, growth rate rose roughly with the protein content of the diet up to 30 per cent. protein. With 18 per cent. protein, growth was about the same as with 74 per cent. Five per cent. protein caused loss of weight at first, then a slow gain. Daily energy intake ranged from 28 Cal. with 5 per cent. protein to 50 Cal. with from 18 to 30 per cent. protein, and 40 Cal. with 74 per cent. protein.

With riboflavin omitted, the food consumption of those with 18 to 30 per cent. casein was two-thirds, and growth half or less, of that of those with the vitamin. Omission of riboflavin had no effect on growth or food consumption with 5 per cent. protein; with 74 per cent. protein and no riboflavin, food consumption was the same as, and growth better than, with 18 per cent. protein.

Rats receiving no riboflavin and given galactoflavin rapidly developed signs of deficiency and lost weight with all levels of protein; the daily energy intake was only 15 Cal. and survival time about 30 days. Those with 74 per cent. protein were most severely affected. With riboflavin and galactoflavin together no toxic effect was seen. It is concluded that a high intake of protein may have toxic effects in riboflavin deficiency.

The signs of deficiency were more severe on diets with 20 per cent. fat than with none or 10 per cent., suggesting that utilisation of protein in riboflavin deficiency was better in the absence of fat.

Corneal vascularisation was found in all rats with 5 per cent. casein and 20 per cent. fat. More protein and riboflavin prevented the eye changes. Fat-free diets delayed their appearance. Similar observations were made on rats receiving galactoflavin. Signs of deficiency were more severe when oxidised replaced fresh lard.—V. R. Jackson.

4421

MAW, A. J. G. **Inherited riboflavin deficiency in chicken eggs.** *Poultry Sci.*, 1954, **33**, 216-217. [Dept. Poultry Husb., Pennsylvania State Univ., State Coll.]

Eggs from 3 related Single Comb White Leghorn hens failed to hatch owing to death of the embryos

during incubation. The white of the eggs lacked the normal greenish-yellow colour which, coupled with the time of death and the appearance of the embryos, suggested that deficiency of riboflavin was involved. The conclusion was confirmed by analysis of the eggs. Injection of riboflavin into the eggs improved hatching, but increase in the riboflavin intake of the hens was without effect. An F_2 population of over 200 birds was reared from the 3 original hens. When the eggs from the F_2 birds were injected with 200 μ g. riboflavin before or up to the 12th day of incubation, the chicks hatched, but all embryos from non-injected eggs died. Of the 88 F_2 females reared, 67 laid normal eggs and 21 laid eggs lacking in riboflavin. It is considered that a recessive gene is responsible, and that birds homozygous for that gene are unable to lay eggs with sufficient riboflavin to ensure the viability of the embryo.

E. M. Cruickshank.

4422

MILLER, E. R., JOHNSTON, R. L., HOEFER, J. A. and LUECKE, R. W. **The riboflavin requirement of the baby pig.** *J. Nutrition*, 1954, **52**, 405-413. [Michigan State Coll., East Lansing.]

Nineteen pigs from 2 litters were taken from the sow after 72 hr. and received a diet of synthetic milk devoid of riboflavin for 4 days; they were then divided into groups receiving no supplement or 1, 2, 3 or 4 mg. riboflavin per kg. solids of the diet. Food was limited only when scouring appeared, mostly during the first week.

All pigs on the basal diet with or without 1 mg. riboflavin showed gross external signs of riboflavin deficiency with a higher incidence of diarrhoea than the others; appetite gradually failed and a state [described as] of multiple deficiencies resulted. Appetite was restored and growth rate improved when a mixture of B vitamins without riboflavin was injected. The livers and kidneys of pigs from these 2 groups showed fatty infiltration; there was much fluid in the peritoneal cavity and pericardial sac, with congestion of the intestine, caecum and colon and some oedema and mucoid degeneration. There were haemorrhages in the rectum. Eye lesions were confined to the lens, cornea and eyelids; there was no corneal vascularisation. The skin showed varying degrees of atrophy and hyperkeratosis. No degeneration of the myelin sheath was found, and no blood change that could be related to the intake of riboflavin.

Pigs receiving 2, 3 or 4 mg. riboflavin per kg. solids of the diet showed no gross sign of deficiency but those receiving 2 mg. gained weight less rapidly and made less efficient use of their food. The requirement for optimum growth and efficiency of feed utilisation was about 3 mg. per kg. solids, which is above the estimate of Forbes and Haines

(Abst. 331, Vol. 23) whose tests were made at a higher environmental temperature; other variables such as relative humidity, genetic make-up and amount of food may have affected the results.

V. R. Jackson.

4423

MILLER, E. R., JOHNSTON, R. L., HOEFER, J. A. and LUECKE, R. W. **The riboflavin requirement of the baby pig.** *J. Animal Sci.*, 1953,

12, 925. *Proc.* [Michigan State Coll., East Lansing.]

4424

AMMERMAN, C. B., WALKER, D. E., EDWARDS, R. M., BECKER, D. E. and TERRILL, S. W. **Riboflavin requirement of weanling pigs.** *J. Animal Sci.*, 1953, 12, 905-906. *Proc.* [Univ. Illinois.]

NICOTINIC ACID (NIACIN)

4425

PRICE, J. M. **Determination of pyridone metabolite of niacin.** *Federation Proc.*, 1954, 13, 276. [Cancer Res. Hosp., Med. Sch., Univ. Wisconsin, Madison.]

4426

GUILD, L. P., LOJIKIN, M. E. and WERTZ, A. W. **Strain differences in niacin metabolism of rats.** *Federation Proc.*, 1954, 13, 459. [Nutrit. Res. Lab., Sch. Home Econ., Univ. Massachusetts, Amherst.]

4427

ETREMOV, V. V., MAKARYCHEV, A. I. and TIKHOMIROVA, A. N. **Vliyanie PP-avitaminoza na uslovnorefleksionnyy deyatel'nost' sobak. [Influence of vitamin PP deficiency on conditioned reflexes in the dog.]** *Vop. Pitan.*, 1954, 13, No. 3, 10-15. [Inst. Pitan., Akad. Med. Nauk SSSR, Moscow.]

Two dogs were given a diet containing, per cent., casein 9, maize flour 80, lard 7, and salts 4, and the usual vitamins except nicotinic acid. The casein was freed from tryptophan by acid hydrolysis. Weight was recorded, and urinary N-methylnicotinamide and blood diphosphopyridine nucleotide were estimated. Alterations in cortical activity were demonstrated, and depended on the type of higher nervous activity obtaining in the animal. It is suggested that such alterations in cortical dynamics might be used in the diagnosis of clinical and subclinical nicotinic acid deficiency.

D. W. Taylor.

4428

FREY, K. J., SHEKLETON, M. C., HALL, H. H. and BENNE, E. J. **Inheritance of niacin, riboflavin and protein in two oat crosses.** *Agronom. J.*, 1954, 46, 137-139. [Iowa State Coll., Ames.]

F₂ selections from 2 crosses of oats were examined for segregation of nicotinic acid, riboflavin and protein contents. Transgressive segregation for nicotinic acid was present in both crosses, and for high but not low riboflavin. Most of the F₂ selections had a higher riboflavin value than the mean of the 2 parents. Low protein and low nicotinic acid content were dominant in one of the

crosses and each was controlled apparently by a large number of genes.

Heritability varied among crosses but average values were 50, 49 and 15 per cent. for nicotinic acid, riboflavin and protein, respectively.

It is concluded from the heritability values that the development of strains of oats with a higher inherent nicotinic acid or riboflavin content should be easily attained.—V. R. Jackson.

4429

WERTMAN, K., SMITH, L. W. and O'LEARY, W. M. **The effects of vitamin deficiencies on some physiological factors of importance in resistance to infection. 1. Niacin-tryptophane deficiency.** *J. Immunol.*, 1954, 72, 196-202. [Div. Bacteriol., Dept. Biol. Sci., Univ. Pittsburgh, Pa.]

Male albino rats were fed up to a bodyweight of from 40 to 45 g. on a basal diet containing, per cent., sucrose 44.6, purified casein 9, maize grits 40, maize oil 2, salts 4, small amounts of choline chloride, L-cystine, *D*-inositol, *p*-aminobenzoic acid, *d*- α -tocopheryl acetate and 2-methyl-1:4-naphthaquinone, with adequate supplements of vitamins A, D and all members of the B complex. Group 1 of 10 rats was fed to appetite on the complete diet; for group 2 of 12 rats the food intake was reduced to equal that eaten by group 3 of 40 rats, from whose diet nicotinic acid was removed. The average weight gain of the 3 groups in 8 weeks was 216, 41 and 34 g., respectively. On the day before the rats were killed, blood was obtained by tail bleeding. There was no significant difference between the groups in red and white cell counts, but differential counts of the latter showed a large increase in the proportion of neutrophils (polymorphonuclear cells) in the blood of groups 2 and 3.

After the rats had been bled to death under an anaesthetic, the separated serum showed a much reduced complement activity in group 2 compared with group 1, and there was no detectable activity in the serum of group 3. To investigate leucocyte activity, an inflammatory process was excited on the day before death by intraperitoneal injection of a mixture of 15 per cent. nutrient broth and

85 per cent. Locke's solution. After death the exudate from the peritoneal cavity was centrifuged and the sediment corresponding to groups 2 and 3 contained a much lower concentration of leucocytes than that corresponding to group 1. The concentrated supernatant liquid was tested for presence of "leukotaxine" with Menkin's dye technique by intradermal injection into marked areas of the shaved abdomen of a white rabbit, and by observation of the amount of dye accumulated in the marked areas after trypan blue had been injected into the marginal vein of the rabbit's ear. There was no difference in the results to suggest any alteration in capillary permeability caused by inanition or deprivation of nicotinic acid.

Preparations of bone marrow from the tibia showed lymphopenia in groups 2 and 3 compared with group 1.—H. Chick.

4430

VAN REY, W. Zur Frage eines biologischen Antagonismus zwischen Nicotinsäure und Isonicotinsäurehydrazid. [Biological antagonism between nicotinic acid and isonicotinic acid hydrazide.] *Klin. Wochenschr.*, 1954, **32**, 229-230. [Neurol. Klin., Univ. Würzburg.]

In view of the association of nerve lesions with large doses of isonicotinic acid hydrazide in tuberculous patients, a microbiological study was made with *Lactobacillus arabinosus* to find whether the hydrazide was antagonistic to nicotinic acid. With a medium containing adequate nicotinic acid addition of 10 to 100 μ g. isonicotinic acid hydrazide per ml. caused little or no inhibition of growth. With 1000 μ g. per ml. inhibition occurred. The effect on growth of *L. arabinosus* was probably not related to the effect on intermediary metabolism in man.—A. M. Copping.

4431

GUTMANN, N., FELTON, S. and HUENNEKENS, F. M. Effect of isonicotinic hydrazides on enzyme systems. *Biochim. biophys. Acta*, 1954, **14**, 282-283. [Dept. Biochem., Univ. Washington, Seattle.]

4432

ROSEN, F. Effects of isonicotinic acid hydrazide in rats fed diets deficient in niacin or pyridoxine. *Federation Proc.*, 1954, **13**, 121. [Ortho Res. Found., Raritan, N.J.]

VITAMIN B₆ (PYRIDOXINE, ADERMIN)

4433

EMERSON, G. A., BOXER, G. E. and GILFILLAN, E. W. Vitamin B₆ deficiency in monkeys. *Federation Proc.*, 1954, **13**, 456. [Merck Inst. Therap. Res., Rahway, N.J.]

is discussed with reference to the changes in leucocyte count and thymus weight.

A. M. Copping.

4435

BEATON, J. R., BEARE, J. L., BEATON, G. H., CALDWELL, E. F., OZAWA, G. and McHENRY, E. W. Studies in vitamin B₆. 5. Chronological sequence of biochemical defects in the vitamin B₆-deprived rat. *J. Biol. Chem.*, 1954, **207**, 385-391. [Dept. Pub. Health Nutrit., Sch. Hyg., Univ. Toronto.]

4434

BUTLER, L. C. and MORGAN, A. F. Leucocyte and thymus changes in the pyridoxine-deficient young and adult male rat. *Proc. Soc. Exp. Biol. Med.*, 1954, **85**, 441-444. [Dept. Home Econ., Univ. California, Berkeley.]

Leucocyte counts made on smears of tail blood from young and adult rats given diets lacking in vitamin B₆ showed that there was a decrease in the number of lymphocytes in comparison with rats receiving the vitamin and allowed food to appetite. Other rats paired by weight and given vitamin B₆ showed lymphocyte counts as low as those of deprived rats. Increased numbers of granulocytes were found only in rats deprived of vitamin B₆. Deprivation of vitamin B₆ caused a great decrease in the weight of the thymus gland in young and adult rats within 5 weeks. A smaller decrease occurred in animals given vitamin B₆, with food intake restricted. After deprivation for 8 weeks the weight of the thymus was restored to normal in about 7 weeks when vitamin B₆ was given. The effect of vitamin B₆ deficiency on the output of adrenal hormones (Abst. 3058, Vol. 24)

A diet lacking vitamin B₆ and containing 20 per cent. casein and 20 per cent. maize oil was given to 180 rats with an average initial bodyweight of 142 g., after a week during which 50 μ g. pyridoxine were given daily to each rat. Of 18 groups of 10 rats containing equal numbers of males and females, one group was killed immediately, 8 groups received no pyridoxine, and 9 groups had pyridoxine, of which 4 were fed to appetite and 5 were restricted to the food intake of the deprived animals. One deprived and one non-deprived, restricted or non-restricted, group were killed each week for 8 weeks and in the carcasses moisture, protein and crude fatty acids were estimated. Total vitamin B₆ in the liver and carcass, liver transaminase activity and urea formation by liver slices were estimated.

Rats deprived of vitamin B₆ showed retardation of growth with almost no gain in weight after 4

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weeks' deprivation. Skin lesions were not seen until after 6 weeks. The pair-fed, non-deprived rats grew only slightly less well than the fully fed rats and the vitamin B₆ content of the liver and other tissues remained constant; that of the deprived rats decreased within one week. Tissue analyses showed that the difference in bodyweight between the groups was almost entirely due to absence of fat in the deprived rats. No significant difference in the protein content of the body or the N metabolism occurred for at least 4 weeks, by which time total crude fatty acids and total vitamin B₆ values had fallen to steady low levels in the deprived rats. In rats having vitamin B₆ the transaminase activity for aspartic acid and glutamic acid and for alanine and glutamic acid systems increased with age; those in deprived rats changed very little. The probable secondary relation of changes in N metabolism to primary changes in fat metabolism is discussed.

A. M. Copping.

4436

DESKACHAR, H. S. R. and McHENRY, E. W. **Some effects of vitamin B₆ deficiency on fat metabolism in rats.** *Biochem. J.*, 1954, **56**, 544-547. [Dept. Pub. Health Nutr., Univ. Toronto, Canada.]

Rats with an average initial weight from 120 to 130 g. were given fat-free basal diets lacking vitamin B₆, and containing 94 per cent. casein, or 74 per cent. sucrose and 20 per cent. casein. Some rats received 50 µg. pyridoxine hydrochloride daily, some 20 mg. linoleic acid and some both. The composition of the carcass and liver was examined after 8 or 10 weeks of the experimental diets. The total fat in the liver was greater in rats having the high-casein diet than in those having the high-sucrose diet, and deprivation of pyridoxine or addition of linoleic acid had no effect. The total body fat was less in rats having the high-casein diet and, with both diets, lack of pyridoxine decreased it. The decrease was partly prevented by administration of linoleic acid. In rats not given pyridoxine the amount of phospholipins and unsaturated fatty acids was about the same as in rats given the vitamin. The occurrence of fat synthesis in the rats not given pyridoxine was shown by the incorporation into the body fats of glucose labelled with ¹⁴C to the same extent as in rats having pyridoxine. It is suggested that the lower total fat content of deprived rats might have been due to more rapid utilisation rather than to failure of synthesis.—A. M. Copping.

4437

HAWKINS, W. W. and LEONARD, V. G. **Excretion of nitrogen in vitamin B₆ insufficiency.** *Federation Proc.*, 1954, **13**, 226. [Nutrit. Sect., Vol. 24, No. 4

Maritime Reg. Lab., Nat. Res. Council, Canada, Halifax, N.S.]

Experiments with rats.

4438

DINNING, J. S., YOUNG, J. M. (Jr.), SIMMONS, M. R. and DAY, P. L. **Effects of a combined deficiency of vitamins E and B₆ on blood picture of rat.** *Proc. Soc. Exp. Biol. Med.*, 1954, **85**, 280-282. [Dept. Biochem., Univ. Arkansas Sch. Med., Little Rock.]

Restriction of weanling Sprague Dawley rats to a diet deficient in vitamins E and B₆ for 105 days caused counts of total leucocytes which were about double those in animals given the vitamins. The increase was most pronounced in the peripheral neutrophils, which reached 10,500 per µl. compared with only from 1500 to 2400 in rats given the vitamins. Administration of vitamin E or vitamin B₆ effectively prevented the increase of leucocytes, but there were differences in the growth rate according to which vitamin was given. The average final weight without any supplement was 102 g., with vitamin E 106 g., with vitamin B₆ 194 g., and with both vitamins 223 g. The rats without vitamin B₆ exhibited slight lymphopenia, which was not affected by vitamin E. None of the animals developed anaemia.—T. Moore.

4439

SAUBERLICH, H. E. **Microbiological studies on the functions of ciferovron factor and vitamin B₆.** *Federation Proc.*, 1954, **13**, 288. [Dept. Animal Husb. Nutr., Alabama Polytech. Inst., Auburn.]

4440

SELBY, P. N. (Jr.), CHRISTENSEN, H. N. and RIGGS, T. R. **An antihemolytic action of pyridoxal.** *Proc. Soc. Exp. Biol. Med.*, 1954, **85**, 388-389. [Dept. Biochem., Med. Sch., Tufts Coll., Boston, Mass.]

4441

IKAWA, M. and SNELL, E. E. **Oxidative deamination of amino acids by pyridoxal and metal salts.** *Federation Proc.*, 1954, **13**, 235-236. [Biochem. Inst., Univ. Texas, Austin.]

4442

BIEHL, J. P. and VILTER, R. W. (with BEALL, F. C. and KENNEDY, C. E.) **Effect of isoniazid on vitamin B₆ metabolism; its possible significance in producing isoniazid neuritis.** *Proc. Soc. Exp. Biol. Med.*, 1954, **85**, 389-392. [Dept. Int. Med., Coll. Med., Univ. Cincinnati, Ohio.]

Peripheral neuritis occurred as a side effect in 14 of 36 patients receiving isoniazid (isonicotinic

acid hydrazide) for tuberculosis, but not in 20 others who received pyridoxine in addition to isoniazid. In some patients pyridoxine cured the neuritis if it was given at the onset of symptoms; in others it was ineffective, and late residual neuritis failed to respond in the 22 patients treated. Patients receiving isoniazid excreted in the urine excessively large amounts of vitamin B₆, and an increased amount of xanthurenic acid after a test dose of tryptophan. The evidence of abnormal vitamin B₆ metabolism in patients taking isoniazid might account for the occurrence of peripheral neuritis. No contra-indication to the simultaneous administration of pyridoxine is at present known.—A. M. Copping.

4443

KOTAKE, Y., INADA, T. and MATSUMURA, Y. **Research on xanthurenic acid. 5. Experiments of protracted accumulative effects of xanthurenic acid causing chronic diabetic symptoms in white rats.**

KOTAKE, Y. and INADA, T. **6. Effect of xanthurenic acid upon glycogen amount in liver, heart muscle and skeletal muscle.** *Proc. Japan Acad.*, 1953, **29**, 405-410; 411-414. [Dept. Biochem., Wakayama Med. Coll.]

For earlier work see Abst. 3061, Vol. 24.

5. In order to maintain continuously a concentration of xanthurenic acid in the organism, groups of about 8 young rats were given a diet of, per cent., casein 25, butter 35, salts 2, agar 3, sugar 5, starch 28 and yeast 2. They excreted 1 mg. xanthurenic acid daily in the urine and when, for the first 30 days, they received also 10 mg. tryptophan daily the amount excreted was from 2 to 3 mg. Bodyweight increased steadily and reached a maximum mean weight of 325 g. about the 170th day. The mean blood sugar value increased also. The rats began to lose weight about the 200th day and died about the 240th day.

In another experiment concentration of xanthurenic acid was maintained in the body by deprivation of vitamin B₆ and administration of 10 mg. tryptophan daily. The amount of xanthurenic acid in the urine was from 4 to 7 mg. daily. Blood sugar was raised, and tests showed a much lowered sugar tolerance.

With a diet high in casein and fat, and deficient in vitamin B₆, histological examination of the pancreas showed severe pathological changes in the beta cells of the islets of Langerhans.

The cumulative effect over a long period of xanthurenic acid in causing diabetes in rats is considered to be proved.

6. Rats weighing about 150 g. were fed for a week on a diet of, per cent., casein 22, agar 3, butter 10, starch 53, salts 6, yeast 2 and sugar 5. They were fed for the last time 24 hr. before they were killed; 200 mg. xanthurenic acid per kg. bodyweight were injected intraperitoneally, and the rats were killed 4, from 6 to 8, or 72 or more, hr. later. Blood sugar and liver glycogen were estimated.

Blood sugar was above normal after the first interval of 4 hr., somewhat below normal after the second interval, and again above normal after the third interval; such behaviour of the blood sugar is regarded as characteristic after injection of xanthurenic acid.

The content of glycogen in the liver was below normal in all 3 periods, but was higher in the middle period of low blood sugar than in the preliminary period of high blood sugar, and lowest of all in the third period. In the heart muscle the amount of glycogen rose progressively above normal from the moment of injection of xanthurenic acid. In skeletal muscle it decreased gradually. The results are like those in alloxan diabetes.—E. M. Hume.

4444

KRATZER, F. H., WILLIAMS, D. E., MARSHALL, B. and DAVIS, P. N. **Some properties of the chick growth inhibitor in linseed oil meal.** *J. Nutrition*, 1954, **52**, 555-563. [Dept. Poultry Husb., Univ. California, Davis.]

Diets containing 30 per cent. of different linseed oilmeals depressed the growth of chicks. The growth inhibitor was destroyed by treatment with water or by autoclaving but not by dry heat. It is, therefore, suggested that the inhibitor is destroyed by chemical, and not by enzymic or microbiological action. For counteracting the inhibitor, addition to the diet of 37.5 mg. per kg. of pyridoxine was twice as effective as a daily intramuscular or intraperitoneal injection of 1 or 5 mg. pyridoxine. Pyridoxine, pyridoxal and pyridoxamine were equally effective, on a molar basis. Aureomycin did not improve the growth of chicks given linseed oilmeal, which showed that it did not appreciably stimulate the intestinal synthesis of vitamin B₆.—E. M. Cruickshank.

See also Abst. 5026.

PANTOTHENIC ACID

4445

TOEPFER, E. W., ZOOK, E. G. and RICHARDSON, L. R. **Microbiological procedure for the assay of pantothenic acid in foods: results compared with those by bioassay.** *J. Assoc. Off. Agric. Chem.*, 1954, **37**, 182-190. [Bur. Human Nutrit., U.S. Dept. Agric., Washington 25, D.C.]

Preliminary experiments with yeast as test material showed that a mixture of intestinal phosphatase and pigeon-liver enzymes gave satisfactory liberation of bound pantothenic acid so that a consistent maximum response was obtained in microbiological estimations with *Lactobacillus arabinosus* 17-5. The optimum amounts of liver phosphatase and Dowex-treated pigeon-liver enzymes for full release of the vitamin were estimated, and the results were compared with those obtained with Mylase-P as the releasing enzyme. The results of the microbiological methods were compared with those of a test with rats. Reasonably good agreement was found in the values for carrots, dried egg, kale, groundnuts, pork liver and brewer's yeast, provided that the samples for the microbiological tests were prepared by digestion with intestinal phosphatase and pigeon-liver enzymes. Other means of extraction gave values significantly lower than those of the rat tests.

A. M. Copping.

4446

BERGAMINI, C. Riconoscimento cromatografico dell'acido pantotenico e separazione di vitamine dell "complesso B". [**Chromatographic identifications of pantothenic acid and separation of vitamins of the B complex.**] *Sperimentale*, 1953, **4**, 38-44. [Ist. Chim. Anal., Univ. Florence.]

The method depended on the acid hydrolysis of pantothenic acid and estimation, from the brown colour with iodine, of the β -alanine formed. The violet colour given with ninhydrin was used in confirmation. The paper chromatogram was of the radial type. The solvent was butanol, acetic acid and water in the proportion 4:1:5. The method could be used quantitatively with a descending chromatogram. Reactions are given also for identification of vitamin B₁, riboflavin, pyridoxine and nicotinamide.—E. M. Hume.

4447

REID, M. E. and BRIGGS, G. M. **Nutritional studies with the guinea pig. 2. Pantothenic acid.** *J. Nutrition*, 1954, **52**, 507-517. [Lab. Biochem., Nat. Inst. Health, U.S. Dept. Health.]

Guineapigs aged from 10 to 21 days were kept in screen-bottomed cages, and given a purified diet

lacking pantothenic acid for 6 weeks. Mortality was high among the guineapigs given the diet from an early age. With a supplement of pantothenic acid good growth was obtained with the same diet. The deprived guineapigs showed poor weight gains, had rough coats, with generally poor condition, and finally developed diarrhoea, lost appetite and died. The adrenal glands showed hyperaemia, enlargement and, in some, haemorrhages. Preliminary blood studies showed no change in Hb, haematocrit, total leucocytes or granulocytes, in moderate states of deficiency.

The pantothenic acid requirement of the guineapig was investigated with groups of animals having 10, 15, 20, 30 or 40 mg. pantothenic acid per kg. diet. Ten mg. was inadequate but 20 mg. was fully sufficient. There was no evidence that inclusion of large amounts of ascorbic acid in the diet improved condition on a suboptimum intake of pantothenic acid.—A. M. Copping.

4448

LEFEBVRES-BOISSELOT, J. and RATSIMAMANGA, A. R. Acide pantothenique et fonctionnement surrénalien. [**Pantothenic acid and adrenal function.**] *J. Physiol., Paris*, 1954, **46**, 410-412. [Lab. Physiol. Nutrit., École Hautes-Études, C.N.R.S., Fac. Méd., Paris.]

4449

HURLEY, L. S. **Adrenal function in pantothenic acid-deficient rats.** *Federation Proc.*, 1954, **13**, 74. [Div. Chem. Embryol., Univ. Colorado Med. Sch., Denver.]

4450

ZUCKER, T. F. and ZUCKER, L. M. **Pantothenic acid deficiency and loss of natural resistance to a bacterial infection in the rat.** *Proc. Soc. Exp. Biol. Med.*, 1954, **85**, 517-521. [Dept. Pathol., Coll. Phys. Surg., Columbia Univ., New York.]

When young rats were given from 3 weeks of age a purified diet lacking pantothenic acid but otherwise adequately supplemented, unexplained sudden death often occurred within 21 days. A respiratory infection was found to be present which produced a serofibrinous pleural and pericardial exudate with small white abscess-like nodules in the lungs and sometimes also in the liver, kidneys and spleen. The cause of the infection was identified as a corynebacterium hitherto considered pathogenic only for mice. The animals remained in good condition until shortly before death. Weanling rats appeared to be more susceptible to the infection when deprived than rats deprived at 15 weeks of age or when even older.

The problem of such an apparent loss of natural resistance to a specific infection is discussed.

A. M. Copping.

4451

SERONDE, J. (Jr.) **Resistance of rats to inoculation with corynebacterium pathogenic in pantothenic deficiency.** *Proc. Soc. Exp. Biol. Med.*, 1954, **85**, 521-524. [Dept. Pathol., Coll. Phys. Surg., Columbia Univ., New York.]

The observation of Zucker and Zucker (see preceding Abst.) that young rats deprived of pantothenic acid became susceptible to infection with a type of corynebacterium was further investigated with the same strains of rats and the same basal diet with or without addition of pantothenic acid. Inoculation of 0.15 ml. of a broth culture of the organism produced typical infection in rats deprived from 3 weeks of age of pantothenic acid for as little as 16 days, but not in animals given pantothenic acid. The failure of

resistance occurred before any sign of deficiency could be detected. In rats given the deficient diet at 4 weeks of age considerable immunity had been built up and the lesions that occurred after inoculation often were localised and subsequently healed completely.—A. M. Copping.

4452

MELAMPY, R. M. and CAVAZOS, L. F. **Effects of pantothenate deficiency on mouse seminal vesicles.** *Federation Proc.*, 1954, **13**, 98-99. [Iowa Agric. Exp. Stat., Iowa State Coll., Ames.]

4453

POPP, E. M., SHUKERS, C. F., DINNING, J. S. and DAY, P. L. **Effect of aminopterin on coenzyme A synthesis by rats.** *Federation Proc.*, 1954, **13**, 473-474. [Lab. Serv., Univ. Arkansas Sch. Med., Little Rock.]

BIOTIN

4454

DHYSE, F. G. **A practical laboratory preparation of avidin concentrates for biological investigation.** *Proc. Soc. Exp. Biol. Med.*, 1954, **85**, 515-517. [Nat. Cancer Inst., Bethesda, Md.]

Avidin concentrate was prepared by dissolving dried egg white in water brought to pH 5.1 with N HCl. Acetone was added and the precipitate was removed and extracted with 1 per cent. NaCl. The filtrates were dialysed for 2 days at 5° C. against distilled water, and the avidin was precipitated with cold ethanol from the salt solutions. After centrifuging, the precipitate was freeze-dried. For dialysis, cold running tap water low in Fe could be used.

Yeast was grown in the medium of Hertz (Abst. 238, Vol. 13) containing 10^{-4} μ g. biotin per test tube; the avidin concentrate was added in graded amounts and its inhibiting action was estimated. In a typical test, from 800 g. dried egg white containing initially 3200 units avidin activity, a concentrate was obtained containing 1200 units in 800 mg., a recovery of 38 per cent. Of the loss, 1122 units could be accounted for. A unit of avidin activity is defined as "that amount required to completely neutralize the yeast growth supported by one μ g. of free crystalline biotin". The results are similar to those of Eakin *et al.* (Abst. 2102, Vol. 11) with fresh egg white. The concentrate corresponded with the fraction XA of avidin reported by Fraenkel-Conrat (Title 39, Vol. 23).—V. R. Jackson.

4455

TERROINE, T. (with CANNEPIN, M. and BUISSON, F. L.) **Protection importante contre la**

carence en biotine par plusieurs systèmes oxydo-réducteurs. [Protection by several oxidation-reduction systems against biotin deficiency.] *Arch. Sci. physiol.*, 1954, **8**, 61-89. [Lab. Biochim. Nutrit., C.N.R.S., Bellevue, Seine-et-Oise.]

Male albino rats received basal diets containing egg white with or without biotin, and some groups received in addition methylene blue, neutral red or ascorbic acid.

Methylene blue, neutral red and ascorbic acid each delayed the onset of signs of biotin deficiency and reduced the initial number of animals affected. The protection against these signs given by the first 2 substances was only temporary but ascorbic acid often gave permanent protection. Survival time was increased by methylene blue and ascorbic acid but not neutral red. The severity of signs in rats not receiving any of these compounds was lessened by increasing 5-fold the amounts of vitamins B₁ and B₆ and riboflavin in the diet.

Deficient rats had greatly increased protein requirements with ammonia in urine, and administration of oxidation-reduction compounds had no effect. Methylene blue did not prevent loss of weight in deficient rats; neutral red and ascorbic acid allowed growth in some at normal rate. There was no relation between growth rate and degree of severity of signs.

Biotin deficiency caused a secondary deficiency of ascorbic acid if the biotin concentration in liver and adrenals fell below 25 and 10 per cent. of normal, respectively. It appeared that the oxidation-reduction compounds could replace biotin temporarily but it is concluded that there was a distinction between clinical signs, alopecia,

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"spectacle" eyes and abnormal gait, which these compounds alleviated, and those which were followed by death.

In discussion, it is concluded that the protection given by methylene blue, neutral red and ascorbic acid, was probably due to their roles as transporters of hydrogen but that biotin itself, though presumably acting in hydrogen transport, must also participate in unidentified reactions governing growth and normal N metabolism.

V. R. Jackson.

4456

HARRILL, I., JOHNSON, D. and PARSONS, H. T. **Biotin synthesis with indigestible residues in digestive tract of rat.** *Federation Proc.*, 1954, **13**, 460-461. [Dept. Food Nutrit., Sch. Home Econ., Univ. Wisconsin, Madison.]

4457

MOAT, A. G. and LICHSTEIN, H. C. **The role of biotin in carbohydrate metabolism of *Saccharomyces cerevisiae*.** *Arch. Biochem. Biophys.*, 1954, **48**, 300-309. [Dept. Bacteriol., Univ. Minnesota, Minneapolis.]

A strain of *Saccharomyces cerevisiae* was grown in media with graded amounts of biotin. Growth increased with amounts of biotin increasing from 10^{-4} to 10^{-2} μ g. per ml. Stimulation of fermentation and oxidation of glucose by biotin could be demonstrated, but only between certain critical concentrations.

Sucrose and fructose were oxidised by the yeast at the same rate as glucose, and biotin stimulated the oxidation of all 3 sugars to the same degree. There were small differences in the extent to which biotin stimulated fermentation of the 3 sugars.

In absence of biotin, aspartic acid stimulated the rate of O_2 consumption to about half the extent to which it was stimulated by biotin. There was no additive effect with biotin. The effect of aspartic acid on fermentation in absence of biotin was variable; a combination of biotin and aspartic acid was more effective than either alone.

It is suggested that biotin plays a part in carbohydrate metabolism by contributing to the synthesis of an enzyme or enzymes connected with respiration, and by acting as a cofactor in fermentation, possibly in connection with the phosphohexoisomerase reaction.—V. R. Jackson.

4458

UMEZAWA, H., OIKAWA, K., MAEDA, K. and OKAMI, Y. **Anti-biotin activity of thiazolidone antibiotic.** *Jap. J. Med. Sci.*, 1953, **6**, 395-403. [Nat. Inst. Health, Tokyo.]

A new antibiotic obtained from *Streptomyces cinnamomensis* was a thiazolidone derivative. Its inhibitory effect on the growth of *Mycobacterium tuberculosis* was studied by dilution methods and by a cup plate technique. The inhibition was overcome by addition of very low concentrations of biotin and by large amounts of desthiobiotin. Pimelic acid exhibited no antagonistic effect to the antibiotic. The antibiotic was the first known naturally occurring antimetabolite for biotin. It was not toxic for animals and its biological effect appeared to be restricted to metabolic processes requiring biotin.

A strain of *Saccharomyces cerevisiae* producing white colonies in presence of biotin and red colonies in its absence was found useful in demonstrating the antagonistic effects of the antibiotic to biotin.—A. M. Copping.

p-AMINO BENZOIC ACID

4459

RODHAIN, J. **Diète lactée et acide paraminobenzoïque dans l'infection due au *Plasmodium vinckei* chez la souris.** [Milk diet and p-aminobenzoic acid in *Plasmodium vinckei* infection of the mouse.] *Ann. Soc. belg. Méd. trop.*, 1953, **33**, 459-461. [Inst. Méd. Trop. Prince Léopold.] French and Flemish summaries.

Hawking (Abst. 4301, Vol. 23) reported that

addition of p-aminobenzoic acid, 1 part per 1000, to milk robbed it of its protective action for mice against *Plasmodium berghei*. With the technique previously used (Abst. 2209, Vol. 24), it is now shown that mice infected with *Pl. vinckei* survived when fed on milk diet and succumbed when p-aminobenzoic acid was added.

E. M. Hume.

See also Abst. 5011.

FOLIC ACID (PTEROYLGLUTAMIC ACID)

4460

HEINRICH, M. R. **Ion-exchange chromatography of pteroylglutamic acid and related compounds.** *Federation Proc.*, 1954, **13**, 227. [Biol. Lab., Amherst Coll., Mass.]

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4461

BRODY, G. **Effects of pteroylglutamic acid and vitamin B₁₂ deficiencies in chicks infected with *Ascaridia galli*.** *Exp. Parasitol.*, 1954, **3**, 240-250. [Dept. Bacteriol., Michigan State Coll., East Lansing.]

A semi-synthetic diet, complete or lacking vitamin B₁₂ or pteroylglutamic acid or both, was given to day-old chicks. After two weeks on the diet the chicks were infected by mouth with about 500 ascarid eggs. They were killed 3 weeks later. The number of worms and their average length were used as criteria for judging the effects of the dietary supplements. Lack of vitamin B₁₂ and pteroylglutamic acid resulted in a high rate of infestation. With deficiency of pteroylglutamic acid alone, the number of worms was increased; with deficiency of vitamin B₁₂ alone, the length but not the number was increased. When both vitamins were present the number and length of the worms were significantly less. In chicks deprived of both vitamins addition of vitamin C to the diet decreased the number of worms. Leucovorin was able to produce the effect of pteroylglutamic acid and vitamin B₁₂. A diet low in vitamin B₆ caused an increase in the number of worms, and if vitamin B₆ was entirely absent almost all the chicks died within 4 weeks.—A. M. Copping.

4462

DOCTOR, V. M., ELAM, J. F., SPARKS, P., LYMAN, C. M. and COUCH, J. R. **Studies on the conversion of folic acid to citrovorum factor by avian liver homogenate.** *Arch. Biochem. Biophys.*, 1954, **48**, 249-255. [Dept. Biochem., Texas Agric. Exp. Stat., College Station.]

The conversion of folic acid to citrovorum factor was studied *in vitro* in liver preparations from hens which had received a practical poultry ration, or a purified diet, or a diet lacking in vitamin B₁₂. In aerobic conditions addition of folic acid or ascorbic acid increased the production of citrovorum factor measured microbiologically with *Leuconostoc citrovorum* as test organism. Addition of both substances had a much greater effect. When conversion proceeded in an atmosphere of nitrogen the effect of ascorbic acid was less and it did not enhance the effect of added folic acid. When vitamin B₁₂ was added *in vitro* it had little effect but injection of vitamin B₁₂ into the hens throughout the period of preparation increased the ability of the liver to synthesise citrovorum factor, and increased the storage of vitamin B₁₂ and of citrovorum factor in the liver and egg yolk.

A. M. Copping.

4463

FOLEY, G. E. and WINTER, W. D. (Jr.) **Studies on conversion of pteroylglutamic acid to citrovorum factor in mammalian liver slice systems.** *Proc. Amer. Soc. Cancer Res.*, 1954, **1**, 14. [Child. Cancer Res. Found., Boston, Mass.]

4464

DOCTOR, V. M., REID, B. L., COUCH, J. R. and TRUNNELL, J. B. **Influence of homocysteine**

on the conversion of folic acid (PGA) to folinic acid (FA-SF). *Federation Proc.*, 1954, **13**, 200. [Texas Agric. and Mech. Coll., College Station.]

4465

LUCKEY, T. D. and REYNIERS, J. A. **Biosynthesis of folic acid and citrovorum factor in the germfree rat.** *Federation Proc.*, 1954, **13**, 466. [Lobund Inst. Res. Life Sci., Univ. Notre Dame, Ind.]

4466

KISLIUK, R. L. and SAKAMI, W. **The stimulation of serine biosynthesis in pigeon liver extracts by tetrahydrofolic acid.** *J. Amer. Chem. Soc.*, 1954, **76**, 1456-1457. [Dept. Biochem., Sch. Med., W. Reserve Univ., Cleveland, Ohio.]

The interconversion of glycine and serine was induced by an extract of pigeon liver. The extract could be inactivated by treatment with Dowex-1 (chloride) and dialysis against a phosphate buffer. The activity was restored by addition of tetrahydrofolic acid in a manner which suggested that it might be a co-factor in the biosynthesis of serine. The utilisation of formate for synthesis of serine by pigeon liver extracts thus inactivated was restored by addition of tetrahydrofolic acid, combined with adenosinetriphosphate, diphosphonucleic acid, glucose-6-phosphate and Mn⁺⁺, but not by tetrahydrofolic acid alone. Folic acid could act as a substitute for tetrahydrofolic acid in the system converting formate to serine.—A. M. Copping.

4467

LASCELLES, J., CROSS, M. J. and WOODS, D. D. **The folic acid and serine nutrition of *Leuconostoc mesenteroides* P60 (*Streptococcus equinus* P60).** *J. Gen. Microbiol.*, 1954, **10**, 267-284. [Microbiol. Unit, Dept. Biochem., Univ. Oxford.]

A detailed study was made of the requirement of *Leuconostoc mesenteroides* P60 for serine. If excess of glycine was present in the medium the organism could synthesise serine provided that pyridoxal or folinic acid was present or the atmosphere was enriched with CO₂. Pyridoxal was not essential for natural growth if serine was present, but the requirement for serine was then increased. When glycine replaced serine a higher concentration of *p*-aminobenzoic acid or of folinic acid was needed. Folinic acid (leucovorin) could replace *p*-aminobenzoic acid when serine was provided, and it could replace both *p*-aminobenzoic acid and CO₂ when glycine was present in large amounts. Folic acid had no effect on the growth of the organism. With a basal medium containing purines and amino-acids, thymidine could be

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substituted for *p*-aminobenzoic acid only when serine was provided. Sulphonamide inhibited growth competitively when *p*-aminobenzoic acid was the limiting factor for growth, but no inhibition occurred if folinic acid was present. When these special needs were provided for, *L. mesenteroides* P60 could be used for estimating serine in materials with a relatively high concentration of glycine and of substances belonging to the folic acid group.—A. M. Copping.

4468

DINNING, J. S. and DAY, P. L. **Influence of folic acid deficiency on metabolism of chicken bone marrow cells.** *Federation Proc.*, 1954, **13**, 455-456. [Dept. Biochem., Univ. Arkansas Sch. Med., Little Rock.]

4469

MAKINO, H. **The physiological relationship between pterines and folic acid.** 1. 2. *Nagoya J. Med. Sci.*, 1953, **16**, 95-100; 101-103. [Dept. Physiol., Sch. Med., Univ. Nagoya.]

1. Suspensions were made by the method of Norris and Majnarich (Abst. 569, Vol. 18) of rabbit bone marrow in a solution containing citrate but no glucose. Cell counts were made before and after incubation for 3 hr. at 37° C. with folic acid, xanthopterin or other substances.

With folic acid at a concentration of 10 μ g. per ml. there was much proliferation of cells, particularly reticulocytes, less at 5 μ g. per ml. and none at 50 μ g. per ml. Xanthopterin, leucopterin and pteric acid too caused proliferation of reticulocytes, slight with 0.5, maximum with 5 and none with 50 μ g. per ml. At equimolar concentrations the pteridines and folic acid had similar effects, showing that haemopoietic action depended on the presence of the pteroyl radical; the conclusion was supported by the inactivity of *p*-aminobenzoylglutamic acid, folic acid from which the pteroyl radical had been eliminated.

2. Rabbit bone marrow suspensions were prepared and to each 2 ml. were added 100 or 10 μ g. folic acid and 100, 10, 1 or 0.1 μ g. aminopterin. Reticulocyte counts were made before and after incubation for 3 hr.

Folic acid prevented the inhibitory effect of aminopterin on cell proliferation when present in concentrations of from 10 to 100 times that of aminopterin. Vitamin B₁₂ in place of folic acid was inactive.—V. R. Jackson.

4470

JACOBSON, W. **The mode of action of folic acid antagonists on cells. The function of the *Leuconostoc citrovorum* factor in cell division and the inactivation of aminopterin.** *J. Physiol.*,

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1954, **123**, 603-617; 618-632. [Strangeways Res. Lab., Cambridge.]

Studies were made of smears and sections of bone marrow and of intestinal mucous membrane of mice before and after treatment with aminopterin and A-methopterin. Some human bone marrow samples also were available from patients with acute leukaemia. From observations on patients treated with small doses of antagonists, and mice treated with large or small doses, it was concluded that both antagonists in high doses of 1 mg. aminopterin or 5 mg. methopterin given by subcutaneous injection could prevent the dividing cells from completing mitosis. Arrest occurred in the metaphase and the process could not proceed to the anaphase. In mice injected with aminopterin the mitoses in the glands of Lieberkühn in the small intestine were severely affected within 2 hr. Pathological forms including tightly clumped chromosomes in metaphase were commonly seen. The epithelium of the villi was severely damaged and patches of complete breakdown occurred, with subsequent bacterial invasion leading to fatal diarrhoea and septicæmia.

The findings were further examined *in vitro* with embryonic chick fibroblasts and osteoblasts. The damage to dividing cells was apparent within 15 min. after application of aminopterin in concentrations between 1 in 2000 and 1 in 20,000. Cells were not prevented from commencing to divide but were arrested in the metaphase. The inhibitory effect of aminopterin on tissue cultures was found to wear off within 24 hr. even when the antagonist remained present in the medium. The effects of methopterin were similar. In further experiments the mechanism by which aminopterin acts on mitosis in cultures of chick embryo fibroblasts and osteoblasts was investigated in presence of folic acid and citrovorum factor. No protection was given by folic acid, but citrovorum factor in a wide range of concentrations prevented the arrest at metaphase of cell division. It is suggested that citrovorum factor may be essential for the step from metaphase to anaphase, and that the inhibitory effect of aminopterin is due to its occupying the position of citrovorum factor within the cell. The failure of inhibition at the end of prolonged exposure to aminopterin appeared to be due to its direct conversion by embryonic chick cells into an inactive compound. Leukaemic cells from acute mouse leukaemia were able to inactivate aminopterin in 24 hr., but normal bone marrow cells had no effect on the antagonist. Further problems arising from the observations are discussed.—A. M. Copping.

4471

MONSON, W. J., HARPER, A. E., WINJE, M. E., ELVEHJEM, C. A., RHODES, R. A. and SARLES,

W. B. **A mechanism of the vitamin-sparing effect of antibiotics.** *J. Nutrition*, 1954, **52**, 627-636. [Dept. Biochem., Univ. Wisconsin.]

Day-old chicks were grouped according to weight and for 4 weeks were given a semi-purified basal diet containing 0, 25, or 500 μ g. folic acid per 100 g.; the diets low in folic acid were supplemented with aureomycin, bacitracin or penicillin. Growth was recorded and at the end of the experiments intestinal bacteria were counted. Coliform bacteria were isolated and tested for their ability to synthesise folic acid. Growth was increased by the antibiotic supplements, and in the contents of the ileum and duodenum, coliform bacteria appeared which were capable of producing increased amounts of extracellular folic acid. At the same time the folic acid content of the liver increased. The probable mechanism is discussed by which antibiotics exercise their sparing action on the vitamin requirement of chicks.—A. M. Copping.

4472

SAUBERLICH, H. E. and SCHAEFER, A. E. **Studies on aminopterin, leucovorin and folacin with the chick.** *Poultry Sci.*, 1954, **33**, 107-111. [Dept. Animal Husb., Agric. Exp. Stat., Alabama Polytech. Inst., Auburn.]

On a basal diet lacking folacin, better growth was given by supplements of folacin than of leucovorin. Aureomycin and penicillin enhanced the growth obtained with suboptimum amounts of those supplements, but with the basal diet alone the antibiotics depressed growth. Aminopterin, 5 mg. per kg. diet, proved toxic to 50 per cent. of the chicks within 21 days. With larger amounts, the degree of toxicity increased, and with smaller amounts growth was depressed, but the chicks survived. Aminopterin was more toxic injected than ingested. Injections of folacin or leucovorin or relatively large dietary supplements of folacin counteracted the toxic effect, but penicillin and aureomycin had no protective action. The slight reduction in concentration of ascorbic acid in the liver caused by ingestion of aminopterin was prevented by injection of folacin or leucovorin.

E. M. Cruickshank.

4473

SANSONE, G. and ZUNIN, C. **Embriopatie sperimentali da somministrazione di antifolici. [Experimental embryopathies due to administration of folic acid antagonists.]** *Acta vitaminol.*, 1954, **8**, 73-79. [Ist Clin. Pediat. "G. Gaslini", Univ. Genoa.] French, English, German and Spanish summaries.

With groups of 5 young female rats fed on a normal diet, the dosage of aminopterin most suitable to produce malformations of the embryos was determined. The most satisfactory proved to be a dose of 0.0125 mg. per kg. bodyweight daily

for 4 days from the 7th or 8th day of gestation, with which were obtained 3 pregnancies with malformed young and 4 resorptions *in utero*. Malformations were present in 15 out of 23 young; birthweight was low but vitality seemed unimpaired. Four of the young had large heads with hydrocephalus, and one had a hare lip; 12 had deformities of the limbs.—E. M. Hume.

4474

WILLIAMS, A. D., WINZLER, R. J. and LAW, L. W. **The effects of A-methopterin on the *in vitro* incorporation of $P^{32}O_4$ into normal and leukemic mouse tissues.** *Cancer Res.*, 1954, **14**, 135-138. [Dept. Biochem. Nutrit., Univ. S. California, Los Angeles.]

4475

NICHOL, C. A. **Studies of the mechanism of resistance to folic acid analogues in a strain of *Streptococcus faecalis*.** *J. Biol. Chem.*, 1954, **207**, 725-732. [Dept. Pharmacol., Sch. Med., W. Reserve Univ., Cleveland, Ohio.]

The mechanism of resistance to inhibition of growth by methopterin and aminopterin was studied by measuring the ability of cells and cell-free extracts of *Streptococcus faecalis* to form citrovorum factor. Cell-free extracts were obtained by sonic disruption of cells suspended in a magnetostriction oscillator of the Raytheon Manufacturing Co.

The enzymic formation of citrovorum factor from folic acid by cell suspensions in anaerobic conditions was favoured by presence in the medium of formate or serine but not of glycine. The amount of citrovorum factor formed was increased with ascorbic acid in the medium, and the effect of ascorbic acid was additive to that of formate and serine. With cell-free extracts, optimum formation of citrovorum factor was obtained only with the further addition of magnesium ions, diphosphopyridine nucleotide and adenosinetriphosphate. Formation of citrovorum factor in intact cells of resistant strains of *S. faecalis* was inhibited only by large amounts of aminopterin or methopterin. In cell-free extracts or in cells of organisms sensitive to the analogues inhibition was obtained with much smaller amounts. It is suggested that resistance to the analogues is produced by decrease in the permeability of the cell, whereby the amount of inhibitor reaching the susceptible enzyme system is reduced.

A. M. Copping.

4476

HAKALA, M. T., PRUSOFF, W. H. and WELCH, A. D. **Development of resistance to folic acid antagonists by *Streptococcus faecalis* 8043.** *Federation Proc.*, 1954, **13**, 223. [Dept. Pharmacol., Sch. Med., Yale Univ., New Haven, Conn.]

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VITAMIN B₁₂

4477

DUMAZERT, C. and VERMEULEN, M. (with GHI-GLIONE, C. and BOZZI-TICHADOU, M.) Sur le titrage biologique de l'activité antipernicieuse des extraits de foie. [Biological estimation of the anti-pernicious-anaemia activity of liver extracts.] *Arch. Sci. physiol.*, 1954, **8**, 37-49. [Lab. Chim., Fac. Méd. Pharm., Marseilles.]

Adult rats, preferably in their second year, were rendered anaemic by a diet containing adequate amounts of carbohydrate, fat, salts and vitamins other than vitamin B₁₂, folic acid and vitamin C, but only very small amounts of protein. In 35 days they lost weight and developed macrocytic anaemia with high mean corpuscular Hb, and a red cell count which had generally fallen to half its original value. A rise in the red cell count, a fall in the mean corpuscular Hb and the occurrence of a reticulocyte crisis were the criteria used in assessing the haemopoietic activity of any preparation. A rat unit of haemopoietic activity was defined as the minimum dose of a substance that would produce the above reactions; by comparison with a standardised U.S.P. liver preparation one rat unit was found to be equivalent to 1/500th of a U.S.P. unit of liver activity. Given by injection, a muscle extract, the amino-acids contained in a casein hydrolysate, Fe, Cu, and folic acid in large doses had no haemopoietic activity. Vitamin B₁₂ given parenterally in doses of from 0.002 to 0.10 µg. also had no appreciable haemopoietic effect, but a single dose of 1.0 µg. produced a good haematological response and a reticulocyte crisis equivalent to that produced by one rat unit of a liver extract. This unit dose of liver extract which was fully active contained far less vitamin B₁₂ than the equivalent minimum active dose of 1 µg. of the vitamin, which suggested that the liver factor active in this anaemia was not vitamin B₁₂ but something else.—L. Wills.

4478

DUMAZERT, C. and VERMEULEN, M. Sur le titrage biologique des facteurs antipernicieux. [Biological estimation of anti-pernicious-anaemia factors.] *C.R. Soc. Biol.*, 1954, **148**, 121-122.

See preceding Abst.

4479

GHOSH, S. and WERNER, G. Assay of hemopoietic activity of vitamin B₁₂ and liver extracts in anaemic mice. *Arch. internat. Pharmacodyn.*, 1954, **97**, 214-220. [Dept. Pharmacol., Sch. Trop. Med., Calcutta.]

The method of Vijayaraghavan and Dunn (Abst. 414, Vol. 21) for estimating vitamin B₁₂ activity with mice made anaemic by injection of phenyl-

hydrazine was fully investigated. It was found to give statistically satisfactory results with liver extracts as well as with crystalline vitamin B₁₂.

A. M. Copping.

4480

HARTMAN, A. M. and DRYDEN, L. P. Rat growth assay method for vitamin B₁₂. *Federation Proc.*, 1954, **13**, 461. [Bur. Dairy Indust., Agric. Res. Serv., U.S. Dept. Agric., Washington, D.C.]

4481

SHERMAN, W. C. and SCHAEFER, H. C. Procedure of assay for vitamin B₁₂ and unidentified growth factors based upon growth of depleted rats. *Federation Proc.*, 1954, **13**, 477-478. [Ralston Purina Co., St. Louis, Mo.]

4482

DAWBARN, M. C. and HINE, D. C. (with REMILTON, E. and BOFINGER, E.) The determination of vitamin B₁₂-activity in the organs and excreta of sheep. 1. Microbiological assay methods. *Austral. J. Exp. Biol. Med. Sci.*, 1954, **32**, 1-22. [Div. Biochem., C.S.I.R.O., Univ. Adelaide.]

Full details are given of the use of growth and lactic acid production by *Lactobacillus leichmannii* 313, and of plate cultures of a mutant of *Bacterium coli*, to estimate vitamin B₁₂ activity in urine, faeces, gut contents and liver of sheep. The test materials were extracted by heating in 0.1 N acetate buffer with added KCN under specific conditions which yielded maximum potency. Crystalline vitamin B₁₂ added to the extracts was recovered satisfactorily. With plate cultures the slopes of the curves of response to doses of the standard and of the test material tended to be divergent. Tube cultures of *L. leichmannii* gave more satisfactory curves of response. The potency of extracts of faeces and gut contents appeared to be greater when estimated by plate culture; that of liver was the same by both methods. The statistical analysis of the data is described in two appendixes.—A. M. Copping.

4483

STIFFEY, A. V., ESPOSITO, R. G. and WILLIAMS, W. L. Comparison of three microbiological assay methods for vitamin B₁₂. *Federation Proc.*, 1954, **13**, 479. [Lederle Labs. Div., Amer. Cyanamid Co., Pearl River, N.Y.]

4484

STAPERT, E. M., FERRER, E. B. and STUBBERFIELD, L. The effect of ascorbic acid and trace elements on vitamin B₁₂ assays. *J. Amer.*

Pharm. Assoc., 1954, **43**, 87-90. [Biol. Control Labs., Upjohn Co., Kalamazoo, Mich.]

In microbiological tests, it was found that Cu in a concentration as small as 0.1 p.p.m. caused appreciable destruction of vitamin B₁₂ when the solution was agitated in a Waring Blender. Cu with ascorbic acid had a greater destructive effect on vitamin B_{12b} than on vitamin B₁₂; both reactions were prevented by the addition of KCN or sodium diethyldithiocarbamate. Molybdate, fluoride and manganous ions also caused destruction of vitamin B₁₂ in solutions containing ascorbic acid, but cobalt, magnesium, iodide, ferrous and zinc ions did not; none of them when tested separately affected the stability of vitamin B₁₂ in solution. Spectrophotometric tests confirmed the destruction caused by ascorbic acid and copper and its prevention by KCN.—K. H. Coward.

4485

BARTILUCCI, A. and FOSS, N. E. **Cyanocobalamin (vitamin B₁₂). A study of the stability of cyanocobalamin in liquid formulations.** *J. Amer. Pharm. Assoc.*, 1954, **43**, 159-162. [Dept. Pharm., Univ. Maryland Sch. Pharm., Baltimore.]

For maintaining stability in a mixture of cyanocobalamin and ascorbic acid the most favourable pH was between 6.0 and 7.0. Tetrasodium ethylenediaminetetra-acetate stabilised cyanocobalamin. Ascorbic acid was most stable in high concentrations of propylene glycol with distilled water, glycerine or Sorbo, or a mixture of glycerine and Sorbo. Cyanocobalamin was doubtfully stable in high concentrations of propyleneglycol and in vehicles containing glucose. For a mixture of cyanocobalamin and ascorbic acid, a vehicle composed of equal parts of propyleneglycol and glycerine afforded maximum stability, about from 80 to 85 per cent. of each being retained after 6 months' storage at 40°C. No cyanocobalamin and only about 10 per cent. of ascorbic acid was lost on storage for 6 months at room temperature. It is suggested that the decomposition products of ascorbic acid play an important part in the decomposition of cyanocobalamin.—K. H. Coward.

4486

GANT, D. E., SMITH, E. L. and PARKER, L. F. J. **Removal of nucleotide from B₁₂ vitamins.** BROWN, F. B. and SMITH, E. L. **New purines in B₁₂ vitamins.** *Biochem. J.*, 1954, **56**, xxxiv; xxxiv-xxxv. [Glaxo Laboratories, Ltd., Greenford, Middlesex.]

4487

FORD, J. E. and HOLDSWORTH, E. S. **Biosynthetic relationships between vitamin B₁₂-like factors.**

Biochem. J., 1954, **56**, xxxv. [Nat. Inst. Res. Dairying, Univ. Reading.]

4488

DION, H. W., CALKINS, D. G. and PFEIFFER, J. J. **2-Methyladenine, an hydrolysis product of pseudovitamin B_{12d}.** *J. Amer. Chem. Soc.*, 1954, **76**, 948-949. [Res. Labs., Parke Davis and Co., Detroit, Mich.]

Quantitative electrophoretic analysis of the pseudovitamin B₁₂ preparation, in which Holdsworth and co-workers (Abst. 2958, Vol. 23) had demonstrated two microbiologically active components, yielded 90 per cent. pseudovitamin B₁₂, 9 per cent. of a microbiologically active red substance and 1 per cent. of an inactive red substance. The active pigment was similar in composition to pseudovitamin B₁₂ but differed in containing adenine in the nucleotide linkage instead of 5:6-dimethylbenzimidazole. It was termed pseudovitamin B_{12d} and yielded on acid hydrolysis 2-methyladenine, the natural occurrence of which has not previously been reported.—A. M. Copping.

4489

PFEIFFER, J. J., CALKINS, D. G. and DION, H. W. **Characterization of pseudovitamin B₁₂ pigments.** *Federation Proc.*, 1954, **13**, 274. [Res. Labs., Parke, Davis and Co., Detroit, Mich.]

4490

HOPPER, J. H. and JOHNSON, B. C. **Vitamin B₁₂ and pseudo vitamin B₁₂ in the nutrition of the calf.** *J. Animal Sci.*, 1953, **12**, 921. *Proc.* [Univ. Illinois.]

4491

ANDREWS, E. D. and ANDERSON, J. P. **Responses of cobalt-deficient lambs to cobalt and to vitamin B₁₂.** *N.Z. J. Sci. Technol.*, 1954, **35**, 483-488. [Dept. Agric., Animal Res. Stat., Wallaceville.]

A flock of 50 lambs run on cobalt-deficient pasture showed signs of unthriftiness at the age of 5 months. In 5 groups of 10 they were then given 7 mg. cobalt once a week by mouth, or an injection of 100 µg. vitamin B₁₂ once a week or 1000 µg. once a week by mouth, or a single injection of 1000 µg., or no treatment. Treatment with cobalt or regular injection of 100 µg. vitamin B₁₂ gave a good growth response. An oral dose of 1000 µg. vitamin B₁₂ was not enough. A single injection of 1000 µg. vitamin B₁₂ gave a limited growth response but the lambs began to lose condition 2 weeks after the injection. Although treatment of cobalt deficiency with vitamin B₁₂ was effective it was too costly. The best method of controlling the deficiency under New Zealand conditions is held to be by topdressing pastures with fertilisers containing cobalt.—A. M. Copping.

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4492

- KERCHER, C. J. and SMITH, S. E. The response of cobalt-deficient lambs to orally administered vitamin B₁₂. *J. Animal Sci.*, 1953, **12**, 922. *Proc.* [Cornell Univ.]

4493

- GREGORY, M. E. and HOLDSWORTH, E. S. A cyanocobalamin-protein complex from sow's milk and desiccated pig stomach. *Nature*, 1954, **173**, 830. [Nat. Inst. Res. Dairying, Univ. Reading.]

Preliminary details are given of a protein complex isolated from sow's milk in the process of purification of the proteins, and from desiccated gastric mucosa (Abst. 1840, Vol. 24). The substance was pink, with absorption maxima at 278 and 362 m μ ., corresponding to the protein and cyanocobalamin fractions, respectively. The complex contained 23.6 μ g. cyanocobalamin per mg.; the amount found by Wijmenga *et al.* (Abst. 3089, Vol. 24) was 12.3 μ g. per mg. in a preparation from pig's stomach. The mode of linkage was investigated by adding ¹⁴CN-labelled cyanocobalamin to a partly purified protein preparation from gastric mucosa. Combination occurred after removal from the cobalamin molecule of the nucleotide and the most labile amide group, but not after hydrolysis to hexa- or hepta-acids. The radioactivity was present in the pink protein, showing that the protein did not displace the cyanide during combination with the vitamin. By blocking specific groups in the protein it was established that free —SH groups were not needed but that —NH₂ or >NH groups were probably involved. Microbiological estimation of the vitamin B₁₂ potency of enzymic digests of the complex suggested that they contained peptide conjugates of cyanocobalamin.—A. M. Copping.

4494

- NOER, B. Lokalisering af den vitamin B₁₂-bindende effekt i svineventrikler. [Location of the vitamin B₁₂ binding effect in pig's stomach.] *Dansk. Tidsskr. Farm.*, 1954, **28**, 1-10. [A/S Ferrosans Mikrobiol. Lab.] English summary.

Factors which might interfere with the binding effect are discussed and details are given for a method to overcome such interfering influences. The binding effect was strongest in the mucosa of the pylorus, and was weaker in the remaining part of the fundus and the muscularis. (From summary.)—K. H. Coward.

4495

- COUCH, J. R., ENER, H. S. and OLCESE, O. Observations on the vitamin B₁₂ binding substance of Vol. 24, No. 4

egg yolk. *Federation Proc.*, 1954, **13**, 194-195. [Texas Agric. and Mech. Coll., College Station.]

4496

- ROSENBLUM, C., WOODBURY, D. T., GILFILLAN, E. W. and EMERSON, G. A. Influence of intrinsic factor upon utilization of orally administered vitamin B₁₂. *Federation Proc.*, 1954, **13**, 475. [Res. Labs., Chem. Div., Merck and Co., Inc., Rahway, N.J.] Experiments with rats.

4497

- ROSENTHAL, H. L. and BROWN, C. L. (Jr.) Vitamin B₁₂ activity of plasma and whole blood from various animals. *Federation Proc.*, 1954, **13**, 475-476. [Dept. Med., Sch. Med., Tulane Univ., New Orleans, La.]

4498

- BAUREDEL, W. R., HOERLEIN, A. B., PICKEN, J. C. (Jr.) and UNDERKOFLEER, L. A. Selection of diet from studies of vitamin B₁₂ depletion using unsuckled baby pigs. *J. Agric. Food Chem.*, 1954, **2**, 468-472. [Vet. Med. Res. Inst., Ames, Iowa.]

Baby pigs were caught in sterile bags at birth or removed by caesarean section and were kept isolated in separate cages; they were reared in early experiments on cow's milk supplemented with mineral salts and egg, and in later tests on mixtures of casein and soya bean protein with minerals and vitamins. The mixtures included no antibiotic and no vitamin B₁₂, but some animals received vitamin B₁₂ by intramuscular injection. With cow's milk mixtures scouring did not occur but with synthetic milks it was serious, and was only partly overcome by modifying the diet. With the more satisfactory diets mortality was low during the 8 weeks of the test. Pigs killed at 8 weeks of age showed very low stores of vitamin B₁₂ in the liver, kidneys and pancreas unless the vitamin had been injected. The main difficulty in rearing unsuckled pigs appeared to be their lack of immunity to disease owing to slowness in formation of γ -globulin in the absence of colostrum; electrophoretic analysis of serum from 8 of the pigs showed only about 25 per cent. of the normal amount of γ -globulin.—A. M. Copping.

4499

- RICHARDSON, L. R. Effect of large doses of vitamin B₁₂ on reproduction in rats. *Federation Proc.*, 1954, **13**, 475. [Dept. Biochem., Texas Agric. Exp. Stat., College Station.]

4500

- CSONKA, F. A., LILLIE, R. J. and MARTIN, W. The maternal diet as a source of growth factors

transmitted by the hen through the egg to the progeny. *J. Nutrition*, 1954, **52**, 285-296. [Bur. Human Nutrit., U.S. Dept. Agric., Washington, D.C.]

Increase in weight of chicks from hens given for 90 days a diet high in protein, as casein, was greater than of chicks from hens on a diet low in protein, from maize. When the breeding diets were supplemented with a vitamin B₁₂ concentrate, the difference in growth of the progeny was not statistically significant. When vitamin B₁₂ was added to the rearing diet the growth response of the chicks was less than when the vitamin was added to the diet of the hens. Dried cow manure added to a rearing diet low in vitamin B₁₂ significantly increased chick growth and was more effective than vitamin B₁₂ alone or combined with cow manure.

In a subsequent experiment the diets of the hens were reversed for a short period. The chicks from hens given the high-protein diet again grew better than those from hens on the low-protein diet. Addition of vitamin B₁₂ to the breeding diets failed to improve the chick's growth. Addition of the vitamin to the rearing mash appreciably increased the growth of chicks from hens on the low-protein diet but increased growth only of the cockerels from hens on the high-protein diet. Addition of cow manure to the rearing mash, after reversal of the maternal diets, produced no significant improvement in chick growth; in some instances growth was actually depressed.

It is suggested that birds on a diet high in casein transmit to their progeny a substance other than vitamin B₁₂ which may be related to the dietary protein.—E. M. Cruickshank.

4501

CSONKA, F. A., OLSEN, M. W. and SIZMORE, J. R. **Chick embryonic death in relation to maternal diet.** *Federation Proc.*, 1954, **13**, 195. [Human Nutrit. Res. Branch, Agric. Res. Serv., U.S. Dept. Agric., Washington, D.C.]

4502

FERGUSON, T. M. and COUCH, J. R. **Gross and histological anomalies of B₁₂-deficient chick embryo.** *Federation Proc.*, 1954, **13**, 456-457. [Texas Agric. and Mech. Coll. System, College Station.]

4503

HST, J. M., BLAYLOCK, L. G. and CARVER, J. S. **The effect of vitamin B₁₂ on certain nitrogenous constituents of chick-embryo blood.** *Poultry Sci.*, 1954, **33**, 407-411. [Dept. Poultry Sci., State Coll. Washington, Pullman.]

Blood was analysed from the 18-, 19- and 20-day chick embryos and the newly hatched chicks of hens reared on basal rations deficient in vitamin B₁₂ with or without added vitamin B₁₂. A vitamin B₁₂ supplement given to the hen produced higher total N levels in the embryo blood. N distribution was altered in the blood of embryos from deprived hens, with an increase in N.P.N. and amino-acid N, urea, uric acid and creatinine. It appeared that the presence of vitamin B₁₂ improved the utilisation of N for synthesis of tissue protein, and that lack of the vitamin allowed accumulation of N.P.N. in the blood.

A. M. Copping.

4504

SPIVEY, M. R. and BRIGGS, G. M. **Vitamin B₁₂ deficiency in the chick and relationship thereto of other nutrients.** *Federation Proc.*, 1954, **13**, 478. [Nat. Insts. Health, Bethesda, Md.]

4505

DECKER, L. E. **Enzyme and coenzyme concentrations of rat tissues with graded intakes of vitamin B₁₂.** *Federation Proc.*, 1954, **13**, 455. [Dept. Chem., Michigan State Coll., East Lansing.]

4506

BOXER, G. E., SHONK, C. E., GILFILLAN, E. W. and EMERSON, G. A. **Changes in coenzyme A concentration during vitamin B₁₂ deficiency.** *Federation Proc.*, 1954, **13**, 185. [Res. Labs., Merek and Co., Inc., Rahway, N.J.]

4507

DUBNOFF, J. W. and BARTRON, E. **Enzyme activation by vitamin B₁₂.** *Federation Proc.*, 1954, **13**, 201. [California Inst. Technol., Pasadena.]

4508

FIRTH, J., MISTRY, S. P., JAMES, M. F. and JOHNSON, B. C. **Vitamin B₁₂ and transmethyl-ation in the baby pig.** *Proc. Soc. Exp. Biol. Med.*, 1954, **85**, 307-309. [Div. Animal Nutrit., Univ. Illinois, Urbana.]

Baby pigs were given a synthetic milk mixture containing alpha-protein and 1.6 per cent. methionine with cerelese, lard, minerals and vitamins except vitamin B₁₂. One group received vitamin B₁₂ and another had dimethylaminoethanol as a methyl acceptor in case lack of vitamin B₁₂ should block its synthesis. The high level of methionine in the diet served as an adequate source of choline even in pigs moribund from lack of vitamin B₁₂. Addition of vitamin B₁₂ to the diet did not affect the amount of choline in the liver or that excreted in the urine. The vitamin B₁₂ content of the liver

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was much greater in the pigs receiving the vitamin. No fatty infiltration of the liver or kidney damage was seen in pigs deprived of vitamin B₁₂ but receiving excess methionine. The results of the study suggested that vitamin B₁₂ is not involved in the direct transfer of methyl groups from methionine to choline.—A. M. Copping.

4509

MISTRY, S. P., VADOPALAIT, I., CHANG, I., FIRTH, J. and JOHNSON, B. C. **Vitamin B₁₂ and transmethylation in pig liver homogenates.** *Federation Proc.*, 1954, **13**, 265-266. [Div. Animal Nutrit., Univ. Illinois, Urbana.]

4510

FIRTH, J., JAMES, M., CHANG, I., MISTRY, S. P. and JOHNSON, B. C. **Vitamin B₁₂ and choline synthesis in the baby pig.** *J. Animal Sci.*, 1953, **12**, 915. *Proc.* [Div. Animal Nutrit., Univ. Illinois, Urbana.]

4511

FIRTH, J., MISTRY, S. P. and JOHNSON, B. C. **Effect of vitamin B₁₂ on methyl synthesis from glycine.** *Federation Proc.*, 1954, **13**, 457. [Div. Animal Nutrit., Univ. Illinois, Urbana.]

4512

BENNETT, M. A., HELLERMAN, J. and DONNELLY, A. J. **Liver lesions due to prolonged feeding of a "labile methyl"-free diet and the protective influence of vitamin B₁₂.** *Proc. Amer. Soc. Cancer Res.*, 1954, **1**, 4-5. [Lankenau Hosp. Res. Inst., Philadelphia, Pa.]

4513

EDWARDS, C. H. and JOHNSON, N. M. **Influence of vitamin B₁₂ and methionine on concentrations of riboflavin, nicotinic acid and xanthine oxidase in hepatic tissue.** *Federation Proc.*, 1954, **13**, 525. [Sch. Home Econ., Tuskegee Inst., Ala.]

Experiments with rats.

4514

RALLI, E. P., DUMM, M. E. and LAKEN, B. **Effects of growth hormone or vitamin B₁₂ on liver constituents following partial hepatectomy.** *Federation Proc.*, 1954, **13**, 474. [Dept. Med., New York Univ.—Bellevue Med. Centre.]

Experiments with rats.

4515

SPIVEY, M. R., BRIGGS, G. M. and ORTIZ, L. O. **Effect of diets high in fat or protein on vitamin B₁₂ deficiency in non-depleted chick.** *Proc. Soc. Exp. Biol. Med.*, 1954, **85**, 451-453.

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[Lab. Biochem., Nat. Inst. Health, Pub. Health Serv., Bethesda, Md.]

Chicks from hens maintained on a standard ration were given for 4 weeks a diet of soya bean meal, yellow maize, glucose, maize oil, minerals, riboflavin and vitamin D, with or without 0.1 mg. vitamin B₁₂ per kg. Growth on the diet with vitamin B₁₂ was similar to that on a stock diet. When the diet with or without vitamin B₁₂ was modified by substituting 20 per cent. of hydrogenated oil or lard for 20 per cent. of maize, depression of growth occurred, which without vitamin B₁₂ was severe. A similar but less consistent effect was obtained when 20 per cent. of vegetable protein replaced 20 per cent. of maize.

E. M. Cruickshank.

4516

MEITES, J. and FENG, Y. S. L. **Prevention by vitamin B₁₂ of protein catabolic action of cortisone.** *Proc. Soc. Exp. Biol. Med.*, 1954, **85**, 341-344. [Dept. Physiol., Michigan State Coll., East Lansing.]

Five groups of young male rats were given a maize and soya bean diet lacking vitamin B₁₂; after 20 days one continued unchanged, the second received vitamin B₁₂, the third cortisone, the fourth cortisone and vitamin B₁₂, and the fifth the same as the last but with food intake restricted to that of the third group. Urinary N was measured at 10-day intervals. Growth was inhibited by cortisone, but the effect was overcome to some extent by vitamin B₁₂. The increase in the daily loss of N in the urine when cortisone was given was prevented when vitamin B₁₂ was given also but not if the food intake was restricted at the same time. Vitamin B₁₂ had no effect on urinary N in the absence of cortisone. The effect of the vitamin appeared to be related to increase of appetite with increased availability of amino-acids or glucose, and consequent counteraction of the effects of protein breakdown. If large doses of 2 or 4 mg. cortisone were injected, vitamin B₁₂ was much less effective in overcoming weight loss and protein breakdown.—A. M. Copping.

4517

MEITES, J. and FENG, Y. S. L. **Counteraction by vitamin B₁₂ of protein catabolic effects of cortisone.** *Federation Proc.*, 1954, **13**, 468-469. [Dept. Physiol., Michigan State Coll., East Lansing.]

Experiments with rats.

4518

GOMIRATO, G. **Quantitative evaluation of the metabolic variations in the spinal motor root cells, studied by biophysical method and following adequate stimulation (muscular**

fatigue). Action on metabolism of vitamin B₁₂.

J. Neuropathol. Exp. Neurol., 1954, **13**, 359-368. [Neuro-Psychiat. Clin., Univ. Turin.]

Young guineapigs weighing from 250 to 360 g. were run to complete exhaustion on a moving belt and killed 10 min. or 24 or 48 hr. after the end of the exercise. Thin sections of the spinal motor nerve roots taken from the lumbar and cervical spinal enlargements were fixed and photographed in ultraviolet light. Radiographic methods were used to estimate the mass, the protein, and the nucleo-protein of the cells. Some animals were given vitamin B₁₂ by injection before or during the exercise or in the resting stage after exhaustion, and some given vitamin B₁₂ were not exercised. Prolonged muscular fatigue reduced the protein and the nucleo-protein in the motor neurons. Protein values were restored to normal in 24 hr. and nucleo-protein in about 48 hr. Injection of vitamin B₁₂ did not affect the amount of protein or nucleo-protein in resting or fatigued cells, but hastened restoration of nucleo-protein after exhaustion.

A. M. Copping.

4519

RABBI, A., VIVIANI, R. and MARCHETTI, M. Ricerche sul contenuto in vitamina B₁₂ del fegato di ratto tiroxinizzato. [The vitamin B₁₂ content of the liver in rats treated with thyroxine.] *Acta vitaminol.*, 1954, **8**, 85-87. [Ist. Chim. Biol., Univ. Bologna.] French, English, German and Spanish summaries.

Of 18 rats weighing from 80 to 120 g., maintained on the diet of Rando and Causeret (Abst. 3159, Vol. 17), 10 received subcutaneously 1 mg. DL-thyroxine daily. After 10 days all the rats were killed. Those not given thyroxine gained from 40 to 56 g., and those given thyroxine from 12 to 24 g. The vitamin B₁₂ content of the liver, estimated microbiologically with *Lactobacillus leichmanii* 4797 ATCC, in $\mu\text{g.}$ per g. dry tissue, ranged from 277 to 520 for the untreated rats and from 515 to 771 for those given thyroxine.

E. M. Hume.

4520

WANG, H., SCHEID, H. E. and SCHWEIGERT, B. S. Histological studies with rats fed diets containing iodinated casein and different levels of vitamin B₁₂. *Proc. Soc. Exp. Biol. Med.*, 1954, **85**, 382-384. [Div. Histol., American Meat Inst. Found., Univ. Chicago.]

Weanling rats were given a diet of maize and soya bean oilmeal with 0.06 per cent. iodinated casein, and with or without 50 $\mu\text{g.}$ vitamin B₁₂ per kg. diet. The animals were killed after 4 or 6 weeks, and their tissues were fixed in Zenker formol and processed by the standard celloidin technique.

No change in the histological picture of the liver, muscle or bone marrow was found in rats deprived of vitamin B₁₂, but in the thyroid gland degenerative changes occurred, which increased as deprivation was prolonged. On administration of vitamin B₁₂ after 4 weeks' deprivation repair of the damage was not complete. Changes occurred also in the testes of deprived rats and they were capable of reversal if vitamin B₁₂ was given after deprivation for 4 weeks. It is suggested that the changes in the thyroid gland and the low spermatogenic activity, shrinkage of seminiferous tubules, and degeneration of interstitial tissue in the testes, might be related to a low output of certain anterior pituitary hormones in animals deprived of vitamin B₁₂.—A. M. Copping.

4521

LING, C. T. and CHOW, B. F. Effect of vitamin B₁₂ on ribose formation in erythrocytes. *Federation Proc.*, 1954, **13**, 253. [Dept. Biochem., Jefferson Med. Coll., Philadelphia, Pa.]

4522

WOOLLEY, D. W. Synthesis of vitamin B₁₂ by spontaneous cancers. *Federation Proc.*, 1954, **13**, 482-483. [Labs. Rockefeller Inst. Med. Res., New York.]

4523

SURE, B. Influence of processing on supplementary value of vitamin B₁₂ to proteins in soft wheat in presence of lysine and threonine. *Federation Proc.*, 1954, **13**, 480. [Dept. Agric. Chem., Univ. Arkansas, Fayetteville.]

4524

SCHÜRCH, A. Die Verwendung von Antibiotika-Vitamin-B₁₂-Präparaten in der Tierernährung. [Use of preparations containing antibiotics and vitamin B₁₂ in stock feeding.] *Schweiz. Landwirtschaft. Monatsh.*, 1953, Nos. 9/10 and 11, pp. 16.

The probable nature of the animal-protein factor is discussed with reference to the contribution of vitamin B₁₂ and certain antibiotics to healthy growth and production in domestic animals. Experimental studies on the effects of vitamin B₁₂ and of antibiotics on chickens, pigs, sheep and dairy cattle are reviewed. The evidence is considered in relation to the problem of changing the existing regulations prohibiting the addition of antibiotics to commercial feed mixtures.

A. M. Copping.

4525

BROWN, W. O. The use of all-vegetable diets in animal feeding. 2. The growth rate of A.P.F. deficient chicks on supplemented vegetable

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protein diets and on animal protein diets.

Res. Exp. Rec. Minist. Agric. N. Ireland, 1952, 47-53. [Minist. Agric. N. Ireland.]

Chicks hatched from eggs of hens maintained on an all-vegetable diet were given diets containing soya bean or groundnut meal with or without supplements of a vitamin B₁₂ concentrate, and growth was recorded for 6 weeks from hatching. With addition of vitamin B₁₂ the mortality was nil, weight increase was much better and utilisation of feed was more efficient. Chicks on standard mash mixtures and those given fish solubles added to the vegetable diet showed greater weight increases than those given vitamin B₁₂ but vitamin B₁₂ was the only supplement capable of preventing death. The growth response to vitamin B₁₂ was not raised to equal that on the stock mash by addition of methionine or of dried rumen contents. The problem of the animal-protein factor requirements of poultry and of the successful practical use of supplements to vegetable diets is discussed.

A. M. Copping.

4526

CARPENTER, K. J., DUCKWORTH, J. and ELLINGER, G. M. **Economies in the use of animal by-products in poultry rations. 2. Vitamin and amino-acid provision for laying hens.** *J. Agric. Sci.*, 1954, **44**, 340-354. [Rowett Res. Inst., Bucksburn, Aberdeenshire.]

For part 1 see Abst. 299, Vol. 23.

In birds given all-vegetable rations during the laying period or from hatching to 18 months of age, egg production was equal to that of birds receiving rations containing animal protein. Early growth was somewhat retarded by the absence of animal protein and was accelerated by aureomycin supplements, but neither the final weight of the pullets nor their egg production was thereby affected. The limited amount of fresh droppings available to hens kept on wooden floors which were cleaned daily provided enough of the animal-protein factor to supply their requirements for sustained egg production. When the ration contained 8 per cent. of cereal protein, supplemented with 3 per cent. groundnut meal or white-fish meal, groundnut meal proved significantly inferior to fishmeal; when the amounts were larger the supplements were of equal value. A ration containing 11 per cent. protein, 3 per cent. of which was provided by white-fish meal, proved adequate for good egg production if the birds were kept in laying pens, but appeared to be less adequate for birds kept in straw yards.—E. M. Cruickshank.

4527

JOHNSON, E. L. **Vitamin B₁₂ requirements of hens as affected by choline and penicillin.** *Poultry Sci.*, 1954, **33**, 100-107. [Dept. Poultry Husb., Iowa State Coll., Ames.]

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Studies were made during 3 years of the hatching capacity of eggs from hens maintained on a basal all-vegetable ration, with or without a supplement of vitamin B₁₂. On the basal ration alone, hatching capacity was reduced from 80 per cent. to about 48 per cent. in 4 months. In one experiment in which the basal ration contained alfalfa, hatching capacity was not reduced even after 54 weeks, though the growth and viability of the chicks were impaired. When the basal diet was supplemented with 2 µg. vitamin B₁₂ per kg., the hatching capacity of the eggs was good, and the hen's requirement for the vitamin is estimated to be not more than that amount. Supplements of choline or penicillin did not influence the amount of vitamin B₁₂ required for good hatching capacity of the eggs or for viability and growth of the progeny. Rapid growth of chicks with marginal reserves of vitamin B₁₂ was obtained on a vegetable diet supplemented with the vitamin.

E. M. Cruickshank.

4528

HANSEN, M. F., PETRI, L. H. and ACKERT, J. E. **Effects of aureomycin and vitamin B₁₂ used separately as feed supplements on resistance of chickens to *Ascaridia galli* (Schrunk).** *Exp. Parasitol.*, 1954, **3**, 122-127. [Dept. Zool., Kansas State Coll., Manhattan.]

In extension of a previous study (Abst. 504, Vol. 24), a basal all-vegetable diet was given to 512 chicks. Three groups had supplements of vitamin B₁₂ or aureomycin or both. Half the chicks in each group were infected with *Ascaridia galli*. The highest ratio of mortality and infestation were among the chicks on the unsupplemented basal diet. The supplements alone or together prevented death and caused significant reduction of the infestation rate. With vitamin B₁₂ and aureomycin together, growth was improved even in chicks infected with ascarids. The number of parasites was reduced by the supplements. Aureomycin appeared to restrict the growth of the worms, and vitamin B₁₂ promoted it; when both were given, they counteracted one another in their effect on growth.—A. M. Copping.

4529

FERRANDO, R., JOUBERT, L., SALIN, J. and GORET, P. **Sur les répercussions de l'adjonction de quelques antibiotiques à la ration alimentaire du poulet et du porcelet. [Ultimate effects of adding antibiotics to the diet of the chicken and pig.]** *Rec. Méd. vét.*, 1953, **129**, 998-1020.

The effect was studied of adding penicillin, aureomycin, streptomycin or a new antibiotic, soframycin, to a practical ration containing meat and fishmeal supplying ample vitamin B₁₂. The supplements improved weight gain and feed utilisation in pigs and chickens. Some deviation

from normal was observed in the distribution of types of bacteria in the gut flora of both species, but the total bacterial count in the faeces was not appreciably altered. The development of bacteria resistant to antibiotics was investigated, and no change appeared to occur in the pig. In the chicken, however, resistant cocci and *Proteus* sp. were found, and prolonged use of antibiotic supplements in poultry feeding was considered to be possibly dangerous. The pigs and chickens showed no sign of anaphylactic sensitivity to the antibiotics tested.—A. M. Copping.

4530

NORDFELDT, S. Användning av vitamin B₁₂-preparat och antibiotika till svin. [The use of vitamin B₁₂ preparations and antibiotics for pigs.] *Kgl. Lantbrukshögsk. Statens Husdjursförsök Särtryck* No. 103, 1953, pp. 31. English summary.

In the first experiment there were 5 groups each of 8 Landrace weaned pigs, given the following additions to normal cereal meal rations: skimmed milk alone and with bacitracin; extracted rape meal with bacitracin or bacitracin and vitamin B₁₂; soya bean meal, sunflower seed meal, bacitracin and vitamin B₁₂. Chalk, dicalcium phosphate and salt, alfalfa meal and "deltafor" were given also. Bacitracin was an American product with 5 g. of it per lb. given at the rate of 2 lb. supplement per ton meals, and the vitamin B₁₂ supplement contained 3 mg. of the vitamin and 3 g. bacitracin per lb., given at the rate of 5.5 lb. per ton. Bacitracin and vitamin B₁₂, alone or together, had no effect on weight gain to 100 kg. or feed cost. Two further experiments confirmed the results.

In a fourth test 6 groups each of 10 weaned pigs were fed on cereal meals with skimmed milk, or soya bean meal alone or with 10, 15, or 20 g. procaine penicillin per ton meal, or 10 g. penicillin and 10 mg. vitamin B₁₂ per ton meal. Growth with soya bean meal was not good but with 10 g. penicillin, with or without vitamin B₁₂, improved to the level obtained with skimmed milk, and beyond it with the larger amounts of penicillin. In contrast neither penicillin nor an animal-protein factor preparation improved growth, which was poor, with rape meal as source of protein, and with soya bean meal 15 or 20 g. procaine penicillin per ton meal mixed with precipitated chalk had no effect; 15 g. procaine penicillin, in chalk, with 9 mg. vitamin B₁₂ per ton, and 20 g. penicillin mixed with alfalfa meal, gave considerable improvement for a time, but there was no advantage at slaughter weight.

For results quoted here with sows and litters see Abstr. 4371, Vol. 23.

A preliminary experiment in artificial rearing

was made with a single litter of 8 pigs, divided at 10 days of age, so that 4 continued with the sow and 4 were fed on Terralac. At weaning there was no difference between them. From weaning at 8 weeks of age they were fed on an ordinary ration of cereals and skimmed milk without antibiotic. The artificially reared pigs did not do quite as well as the suckled.—I. Leitch.

4531

JORDAN, W. J. The use of a liver extract (vitamin B preparation) in scouring in young piglets. *Vet. Rec.*, 1954, **66**, 215. [Rossett, Nr. Wrexham.]

A solution said to contain liver extract, vitamin B₁₂, vitamin B pyrophosphate and folic acid was used in the treatment of scouring in young piglets. Early cases, 228, were injected subcutaneously with $\frac{1}{2}$ to 1 ml. of this preparation. By the second day their faeces had become darker and firmer and by the third day diarrhoea had ceased. Eight of them required a second dose 5 days later, but in none did the disorder become chronic.

When 90 piglets from herds where scouring had always been prevalent were treated prophylactically with this material at 3 days of age, none developed diarrhoea, but older animals showing debility improved only slightly. [There is no mention of control animals.]—W. A. Greig.

4532

ROBISON, W. L., KUNKLE, L. E., CAHILL, V. R. and TEAGUE, H. S. Different levels of protein without and with an antibiotic or a B₁₂ and antibiotic supplement for pigs. *J. Animal Sci.*, 1953, **12**, 930. *Proc.* [Ohio Agric. Exp. Stat.]

4533

KELLY, R. F., BRAY, R. W. and PHILLIPS, P. H. The influence of vitamin B₁₂ and aureomycin supplementation in the ration on the vitamin B₁₂ activity of pork muscle. *J. Animal Sci.*, 1954, **13**, 332-337. [Dept. Animal Husb., Univ. Wisconsin, Madison.]

In a test with 96 pigs of average initial weight 45 lb., a basal diet was given containing 14, 17 or 20 per cent. protein in a mixture of maize, soya bean meal and alfalfa meal. Groups of 12 pigs having each concentration of protein were given vitamin B₁₂, or aureomycin, or both, or no supplement. When the average weight of the group reached 213 lb. the pigs were killed and vitamin B₁₂ was estimated in the muscle microbiologically with *Lactobacillus leichmannii*. When vitamin B₁₂ was given alone there was an increase of the vitamin in the muscle. With aureomycin alone or combined with vitamin B₁₂ there was no increase and in some groups there was a decrease.

N.A. and R., October 1954

The antagonistic effect of aureomycin on the storage of vitamin B₁₂ in pork muscle was confirmed in a second experiment with 56 pigs; a mixture of B vitamins was given instead of crystalline vitamin B₁₂ and the combination of aureomycin and the vitamin B supplement was then less unsatisfactory than in the first experiment.

Intramuscular fat deposition was found to be inversely related to protein intake, and was unrelated to the supplement of vitamin B complex or aureomycin.—A. M. Copping.

4534

KELLY, R. F., BRAY, R. W. and PHILLIPS, P. H. **The influence of vitamin B₁₂ and aureomycin supplementation in the ration on the vitamin B₁₂ activity of pork muscle.** *J. Animal Sci.*, 1953, **12**, 901-902. *Proc.* [Univ. Wisconsin.]

4535

TRIBE, D. E., BOND, J. M. and OSBORNE, A. D. **Response of cobalt-deficient sheep to oral administration of penicillin.** *Nature*, 1954, **173**, 728. [Sch. Vet. Sci., Univ. Bristol.]

Two sheep were maintained on hay and concentrates from a Co-deficient farm, containing, respectively, 0.06 and 0.06 p.p.m. Co and 86 and 122 p.p.m. Fe. After 5 weeks they were given 50,000 units of crystalline sodium penicillin G by mouth daily for 7 weeks. The effect of the penicillin was not apparently felt at first, but after the third week feed intake and rate of weight gain improved. The penicillin contained no Co, but the suggestion is made that it caused a change in the rumen flora which promoted the bacterial

synthesis of vitamin B₁₂ and the better utilisation of the very small amount of Co in the diet.

A. M. Copping.

4536

PETRUSHANOV, V. N. **Sintomitzin-profilakticheskoe snedstvo pri avitaminoznoi dispepsii u telyat. [Synthomycin as a prophylactic in vitamin deficiency dyspepsia in calves.]** *Veterinariya*, 1953, **30**, No. 6, 35. [Sovkhoz "Novoe", Vologodsk. Oblast.]

Dyspepsia and diarrhoea in newborn calves, thought to be due to vitamin deficiency arising from unusually early stallfeeding of the cows, were improved or prevented by the administration of synthomycin in 3 daily doses of from 0.5 to 1 g.—D. W. Taylor.

4537

REGE, D. V. and SREENIVASAN, A. **Influence of folic acid and vitamin B₁₂ on the impairment of nucleic acid synthesis in *Lactobacillus casei* by aureomycin.** *Nature*, 1954, **173**, 728-729. [Foods Sect., Dept. Chem. Technol., Univ. Bombay.]

The synthesis of pentose nucleic acid and deoxy-pentose nucleic acid was studied in cells of *Lactobacillus casei* in media with and without aureomycin and with additions of folic acid or vitamin B₁₂ together or separately. Aureomycin in a concentration of 300 mμg. per 100 ml. inhibited synthesis of both nucleic acids, and the inhibition was overcome by addition of 200 mμg. folic acid or 400 mμg. vitamin B₁₂.—A. M. Copping.

See also Absts. 4582, 4833.

OTHER B VITAMINS

4538

FRAENKEL, G. and PEH-I CHANG. **Manifestations of a vitamin B_T (carnitine) deficiency in the larvae of the meal worm, *Tenebrio molitor* L.** *Physiol. Zool.*, 1954, **27**, 40-56. [Dept. Entomol., Univ. Illinois, Urbana.]

Inclusion of 0.35 μg. carnitine per g. diet allowed the larvae of *Tenebrio molitor* to grow at almost the normal rate on a synthetic mixture of casein, glucose, cholesterol, salt mixture and all known vitamins of the B complex. Larvae having no carnitine died after from 4 to 6 weeks, usually immediately after a moult. Complete recovery of normal growth, colour and condition was observed if carnitine was given after from 3 to 4 weeks' deprivation. The dose of 0.35 μg. carnitine per g. diet did not suffice to produce viable adult pupae, and 1.5 μg. appeared to be needed for optimum growth. The failure of growth in larvae deprived of carnitine was apparently due to cessation of feeding. If normal larvae were starved their fat

content decreased and their water content increased. Larvae deprived of carnitine showed a higher fat content and lower water content than starved, normal larvae. Loss of water was thought to be a contributory cause of death at the moulting stage.—A. M. Copping.

4539

FRÖBRICH, G. **Neue Ergebnisse experimenteller Untersuchungen zur Ernährungsphysiologie des Reismehlkäfers *Tribolium confusum* Duval (Tenebrionidae, Coleoptera). [Physiology of nutrition of the flour beetle *Tribolium confusum*, Duval (Tenebrionidae, Coleoptera).]** *Ztschr. Vitamin-, Hormon- Fermentforsch.*, 1954, **6**, 1-24. [Zool. Inst., Munich.] English and French summaries.

Larvae of *Tribolium confusum* on a synthetic diet containing 20 per cent. purified casein and a mixture of vitamins reached the stage of pupation but showed high mortality unless an active



principle from yeast residues was added to the diet. This substance, known as factor U, appeared to be essential for normal pupation and development of the beetle. The activity of the yeast residue was increased by digestion with papain.

Further investigation of the growth requirement of the larvae showed that the amino-acids arginine, histidine, isoleucine, leucine, lysine, methionine, phenylalanine, threonine, tryptophan and valine were necessary for development of the imago. Several highly purified diets were evolved, and addition of vitamin B₁₂, inositol and *p*-aminobenzoic acid to a satisfactory mixture did not improve growth or metamorphosis. With a basal diet containing vitamin-free casein and glucose, it was possible to use *Tribolium* larvae to test for the presence of vitamins of the B complex in casein and starch. It is suggested that the method could be adapted for estimating amino-acids.—A. M. Copping.

4540

EMMICH, R. and PETZOLD, H. Tierexperimentelle Untersuchungen über die Wirksamkeit des "Leberparenchymfaktors". [Animal experiments on the activity of the liver-parenchyma factor.] *Ztschr. ges. inn. Med.*, 1954, **9**, 95-98. [2. Med. Klin., Martin Luther Univ., Halle-Wittenberg.]

Part of the liver was removed from rats of which some received intravenously for 3 days before the operation, and daily after it for 2 or 10 days, 0.017 or 0.0127 ml. of a liver hydrolysate, Prohepar, as a source of the liver-parenchyma factor; the doses were considered to be equivalent to 5 and 3.5 ml. per day for a 60 kg. man. These doses had no effect on liver histology or serum proteins of the intact animal. After partial removal of the liver, the larger dose produced fatty infiltration of the hypertrophied and regenerating residual liver tissue which was greater than in the animals receiving the smaller dose or none; the infiltration was very marked 2 days after the operation but had almost disappeared after 10 days. After the

operation all the rats showed a drop in the value for total serum protein due to a fall in albumin and α -globulin, which was greatest 2 days after the operation; the fall was greater in the treated animals than in the untreated. The changes in the other globulins were not significant. There was no difference in the blood findings for animals receiving the 2 doses.—L. Wills.

4541

LECOQ, R. Le rôle de l'adénine (vitamine B₄) dans les métabolismes organiques et son retentissement sur l'équilibre acido-basique. [Role of adenine (vitamin B₄) in the metabolism of organic substances and its effect on acid base equilibrium.] *J. Physiol., Paris*, 1954, **46**, 406-410. [Lab. Hôp. Saint-Germain-en-Laye.]

4542

MCDONALD, M. W. and MCCLYMONT, G. L. Studies on nutrition of poultry. 4. Nutritional value of condensed whale solubles in chicken rations. *Austral. Vet. J.*, 1954, **30**, 57-60. [Poultry Exp. Stat., Seven Hills, N.S.W.]

Condensed whale solubles containing 41 per cent. protein were compared with meatmeal in rations for chicks containing wheat and wheat products, minerals, synthetic riboflavin and vitamins A and D, with or without whey powder and alfalfa meal as a source of B vitamins other than riboflavin. When the solubles replaced part of the meatmeal in rations high in B vitamins, growth was significantly increased; when the rations were low in B vitamins the solubles had no growth-promoting effect. When the solubles replaced all the meatmeal in rations high in B vitamins, weight increase was similar to that of chicks receiving meatmeal, but when the ration was low in B vitamins, chicks receiving solubles grew poorly and 16 per cent. died. It is concluded that condensed whale solubles contain a protein as valuable as that of meatmeal, but that they lack a growth factor or factors supplied by meatmeal, alfalfa meal and whey powder.—E. M. Cruickshank.

VITAMIN C (ASCORBIC ACID)

4543

BACKE-HANSEN, K. and NORDAL, A. Jodometrisk bestemmelse av askorbinsyremholdet i torrede nyper. [Iodimetric estimation of ascorbic acid in dried rose hips.] *Dansk. Tidsskr. Farm.*, 1954, **28**, 53-63. [Stat. Farmacopélab., Univ. Oslo.] English summary.

An investigation of the methods for estimating ascorbic acid recommended in *Ph. Spec.* 46 showed that the oxidation of KI by dichlorophenolindophenol in H₂SO₄ required about 5 min. to reach

completion; the method of the *Ph. Dan.* 48 required reduction of the pH from about 3.5 to about 1 by the addition of 10 ml. 2N H₂SO₄. Details are given of the proposed modification of the Danish method. (From summary.)

K. H. Coward.

4544

SULLIVAN, M. X., MAZARELLA, N. M. and LEE, C. Y. Differential estimation of ascorbic acid and reduction [reductone]. *Federation Proc.*, 1954, **13**, 307. [Georgetown Univ., Washington, D.C.]

N.A. and R., October 1954

4545

TERENT'YEVA, E. L. Nekotorye dannye o khimicheskoi sostave askorbigena. [Some data on the chemical properties of ascorbigen.] *Bio-khimiya*, 1953, **18**, 296-301. [Kontrol. Vit. Stants., Moscow.]

Ascorbigen is unstable; a mercury derivative was found which was more stable, and could be stored without decomposition. Analysis of ascorbigen and of its mercury derivative showed it to contain 6 per cent. each of ascorbic acid and tryptophan, probably linked chemically. Two-dimensional paper chromatography of ascorbigen hydrolysates gave evidence for the presence of the amino-acids aspartic acid, glutamic acid, threonine, alanine, methionine, valine, leucine, arginine and histidine, already shown to be present by Pauli's reaction, and probably lysine. In addition two other amino-acids which were not identified were present on the chromatogram. The chromatographic method could be used to identify ascorbigen in biological material.—W. Hughes.

4546

DUDANI, A. T. and KRISHNAMURTI, C. R. Oxidation of ascorbic acid by terramycin. *Biochim. biophys. Acta*, 1954, **13**, 505-509. [Central Drug Res. Inst., Lucknow, India.] French and German summaries.

Of 6 crystalline antibiotics tested, only terramycin exerted any great catalytic effect on the oxidation of ascorbic to dehydroascorbic acid without liberation of CO_2 . The optimum pH was about 8. The activity was specific to ascorbic acid and was not found with numerous other reducing agents and chemicals of biological interest which were tested. The sample of terramycin used was free from trace metals, including Cu. Its activity was not affected by NaCN, glutathione, cysteine and other substances which inhibit the catalytic oxidation of ascorbic acid by Cu.—W. Godden.

4547

PRATT, D. E., BALKCOM, C. M., POWERS, J. J. and MILLS, L. W. Fruit color stability. Interaction of ascorbic acid, riboflavin, and anthocyanin pigments. *J. Agric. Food Chem.*, 1954, **2**, 367-372. [Dept. Food Technol., Univ. Georgia, Athens.]

4548

KÜRTI, V. and HEJNÝ, J. Príspevok k štúdiu vztahu kyseliny askorbovej ku kyseline para-aminosalicylovej. [Relation between ascorbic acid and p-aminosalicylic acid.] *Čas. Lék. čes.*, 1954, **93**, 251-253. [Lab. Div. Tuberculosis, Vysné Hány.] Russian summary.

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4549

NUMERS, C. V. The role of vitamin C in the mucopolysaccharide metabolism of the skin. Studies on free mucopolysaccharides and mast cells in the intact skin and during wound healing in normal and scorbutic guinea-pigs. *Ann. Med. exp. Biol. Fenn.*, 1953, **31**, 398-408. [Dept. Med. Chem., Univ. Helsinki.]

Fourteen guineapigs weighing from 450 to 600 g. were given a scorbutogenic diet, and on the 13th, 14th or 16th day a large piece of the cutis, subcutis and extensor thigh muscle was removed under anaesthesia. Half the animals were killed from 7 to 9, and in one case 16 days later, and the wound was excised. The other half were given 10 mg. ascorbic acid daily from about 5 days after the operation. After from 1 to 5 days' treatment they were killed and the wound excised. Four other animals received a normal diet and the same operational treatment. The skin and the excised tissues were examined histologically with appropriate staining.

In the scorbutic animals the number of mast cells in the corium was very low and did not increase in the wound areas as it normally should, but no morphological difference was detected in the mast cells. In the healing wound, the capacity of the fibroblasts to proliferate was impaired, and mucopolysaccharides could not be detected in connective tissue adjacent to the wound. Mucopolysaccharides were rare in the corium of normal and scorbutic guineapigs, but in the epidermis free mucopolysaccharides were more frequent in the scorbutic animals. The structure of the hair follicles, and consequently the production of hair, were not affected in scurvy.—E. M. Hume.

4550

TURESKY, S. S. and GLICKMAN, I. Histochemical evaluation of gingival healing in experimental animals on adequate and vitamin C deficient diets. *J. Dent. Res.*, 1954, **33**, 273-280. [Dept. Oral Pathol., Tufts Coll. Dent. Sch., Boston, Mass.]

One group of guineapigs was fed on a complete diet and received in addition daily injections of 10 mg. ascorbic acid; two other groups received a diet free from vitamin C. After 14 days, when clinical signs of scurvy were evident in the deprived groups, the gums were cut back in each animal in the non-deprived group and in one of the deprived groups; gingival biopsy samples were obtained from each animal in the other deprived group on the 18th and 28th day. Specimens of healing gum tissue were obtained from the animals in which the gums had been cut 4, 7, 10, 14, 18, 20 and 21 days after the operation. Histochemical studies of all specimens showed that the formation and maturation of basement membrane,

the appearance and increase in amount of ground substance, and the formation of collagen fibres, all essential to normal gingival healing, were impaired in acute vitamin C deficiency.

W. Godden.

4551

LUDWIG, A. W. (with CHEN, D. K.) **Development of experimental exophthalmos in scorbutic guinea pigs.** *Proc. Soc. Exp. Biol. Med.*, 1954, **85**, 424-427. [Dept. Pathol., Med. Serv., Mount Sinai Hosp., New York.]

The thyroid gland was removed from one of 2 groups, each of 20 guineapigs. Nine days after the operation half the animals in each group was given a vitamin-C-free diet and the others continued on an adequate diet. After 18 days, when the animals on the scorbutogenic diet had lost an average of 69 g., all the thyroidectomised guineapigs received daily for 5 days intraperitoneal injections of 3 mg. of the thyrotropic fraction of the anterior pituitary gland. All the animals were then killed. Severe exophthalmos was present in all the thyroidectomised animals whether they had been deprived of vitamin C or not. The eyes of the intact animals, with and without scurvy, showed no change. The increase in the water and hexosamine content of the orbital tissues of the exophthalmic animals was as great in those with scurvy as in those fed on an adequate diet.—W. Godden.

4552

BURNS, J. J., MOSBACH, E. H. and SCHULENBERG, S. **Ascorbic acid synthesis in normal and drug-treated rats, studied with L-ascorbic-1- C^{14} acid.** *J. Biol. Chem.*, 1954, **207**, 679-687. [Res. Serv., Third (New York Univ.) Med. Div., Goldwater Mem. Hosp., New York.]

L-Ascorbic acid-1- C^{14} was administered to normal rats and rats which had received daily 45 mg. chloretone or 30 mg. pentobarbital. The specific activity of the urinary ascorbic acid was measured on successive days. From these values, the amount of the body pool and the turnover rate of ascorbic acid were calculated by the method of Feller *et al.* (Abst. 613, Vol. 21). The average body pool of ascorbic acid in the normal rats was 10.7 mg. per 100 g. bodyweight, in those receiving chloretone 19.2 and in those receiving pentobarbital 19.6. The amounts of ascorbic acid synthesised daily were 2.6, 21.5 and 11.6 mg. per 100 g. bodyweight, respectively, of which 15, 48 and 24 per cent. were recovered in the urine.

W. Godden.

4553

LEVIN, S., DEBONS, A. F. and BACCHUS, H. **Relationship of ketogenesis to disturbance of carbohydrate metabolism in ascorbic acid-deficiency.** *Federation Proc.*, 1954, **13**, 87-88.

[Dept. Physiol., Sch. Med., George Washington Univ., Washington, D.C.]

4554

DE FELICE, F. **Sul significato delle correlazioni intervitaminiche. 1. Il contenuto di acidi l-ascorbico e deidro-l-ascorbico in alcuni organi di cavie C-carenzate e trattate con tiamina, o biotina, o acido p-aminobenzoico. [The significance of vitamin inter-relationships. 1. The content of l-ascorbic and dehydro-l-ascorbic acids in some organs of vitamin-C-deficient guineapigs treated with vitamin B₁, biotin or p-aminobenzoic acid.]** *Arch. Sci. biol., Bologna*, 1954, **38**, 113-118. [Ist. Fisiol. Umana, Univ. Bari.]

For previous results, see Absts. 3565, Vol. 21; 3013, Vol. 23; 529, Vol. 24.

Ascorbic acid and dehydroascorbic acid were estimated in 7 organs and tissues of normal guineapigs weighing from 230 to 260 g., and of 4 groups of from 20 to 30 similar animals maintained on a scorbutogenic diet and given daily, biotin 1 mg., or vitamin B₁ from 5 to 7 mg., or p-aminobenzoic acid 10 mg., or no supplement. Animals were killed at intervals up to the 35th day.

All the 3 vitamins retarded the rate of depletion of ascorbic acid, but the behaviour of dehydroascorbic acid was not consistent, the concentration showing some tendency to increase at first and decline later. All the results for individuals and tissues are tabulated.—E. M. Hume.

4555

MCDANIEL, E. G. and DAFT, F. S. **Effect of ascorbic acid in preventing or delaying multiple B vitamin deficiencies in rats.** *Federation Proc.*, 1954, **13**, 468. [Inst. Arthritis Metabol. Dis., Nat. Inst. Health, Bethesda, Md.]

4556

KHALIL, H. H. **Significance of ascorbic acid in the adrenal cortex.** *Lancet*, 1954, **266**, 912. [Dept. Pathol., Guy's Hosp. Med. Sch., London, S.E.1.]

Twenty rats weighing about 100 g. had the pituitary gland removed, after which 10 of them received daily, for 1 week, by injection, 100 mg. Na ascorbate in saline and the others saline only. They were then killed together with 10 normal, intact controls. The adrenal glands were removed and weighed immediately; their average weight in mg. per 100 g. bodyweight was for controls 25.0 ± 1.2 , for rats receiving Na ascorbate 21.8 ± 1.3 , and for rats receiving saline 12.2 ± 0.2 . Frozen sections of the adrenal glands showed that those from the hypophysectomised rats receiving ascorbic acid contained much less cholesterol than those from the other two groups.—W. Godden.

N.A. and R., October 1954

4557

- DUMM, M. E. and RALLI, E. P. **Influence of ascorbic acid, pantothenic acid and protein on the resynthesis of adrenal cholesterol after stress.** *Federation Proc.*, 1954, **13**, 38. [Dept. Med., New York Univ.-Bellevue Med. Centre, New York.]
Experiments with rats.

4558

- NIGEON - DUREUIL, M., RABINOWICZ, M. and RATSIMAMANGA, A. R. **Activité cortinique de la surrénale du cobaye carencé en vitamine C. [Adrenal cortex activity of the guineapig deprived of vitamin C.]** *J. Physiol., Paris*, 1954, **46**, 482-484. [C.N.R.S., Hautes Études, Lab. Biol. Méd., Fac. Méd., Paris.]

4559

- SCHMIDT, H. and STAUDINGER, H. **Stoffwechsel der Nebennierenrinde und Biosynthese der Corticosteroide. 6. Der Einfluss des Systems Ascorbinsäure-Dehydroascorbinsäure auf die Biosynthese der Corticosteroide unter Berücksichtigung der Wasserstoffionenkonzentration. [Metabolism of the adrenal cortex and biosynthesis of corticosteroids. 6. Effect of the system ascorbic acid-dehydroascorbic acid on the biosynthesis of corticosteroids with reference to the hydrogen ion concentration.]** *Biochem. Ztschr.*, 1954, **325**, 288-294. [Zentrallab., Städt. Krankenanst., Mannheim.]

For details of technique see Abst. 3451, Vol. 24.

In buffered solutions of glucose in 0.9 per cent. saline, the synthesis of corticosteroids by slices of pig adrenal gland was increased by from 30 to 60 per cent. on addition of ascorbic acid in an amount equal to 1 per cent. of the weight of the adrenal slices, but only over the pH range from 6.3 to 6.6. The same was true for dehydroascorbic acid. The addition of ascorbic acid oxidase with ascorbic acid gave no increase at all in corticosteroid synthesis, although the oxidase alone caused an increase of from 40 to 70 per cent. after only 2 hours' incubation.—W. Godden.

4560

- BACCHUS, H. **Maintenance of blood 17-hydroxycorticosteroids following ascorbic acid treatment.** *Endocrinology*, 1954, **54**, 402-408. [Res. Lab., Dept. Physiol., Sch. Med., George Washington Univ., Washington, D.C.]

Two groups of adult male rats from which both adrenal glands had been removed were maintained on Purina chow and saline, and received single injections of 2 mg. cortisone acetate and 10 mg. Na ascorbate per 100 g. bodyweight, or the cortisone acetate and saline. Some animals were

killed before injection or 3, 24, 48, 72 or 96 hr. after injection. Plasma content of 17-hydroxycorticosteroids was estimated and blood leucocyte counts were made. Three hr. after injection the blood plasma values for 17-hydroxycorticosteroids were almost identical in both groups; after 24 hr. the level in the group given Na ascorbate was significantly higher than in the group without. The difference persisted up to 72 hr. but no corticosteroids were present in either group after 96 hr. The leucocyte counts showed that administration of Na ascorbate prolonged the haematological effect of cortisone acetate to 24 hr., but that the values had returned to those before injection after 48 hr. in both groups (*cf.* Abst. 4412, Vol. 23).—W. Godden.

4561

- BURSTEIN, S., DORFMAN, R. I. and NADEL, E. M. **Isolation of excreted corticosteroids in the guinea pig in late scurvy.** *Federation Proc.*, 1954, **13**, 188. [Worcester Found. Exp. Biol., Shrewsbury, Mass.]

4562

- RAHANDRAHA, T. and RATSIMAMANGA, A. R. **Action de la surrénale du cobaye scorbutique sur la désoxycorticostérone en présence de l'a. ascorbique. [Action of the adrenal gland of the scorbutic guineapig on deoxycorticosterone in presence of ascorbic acid.]** *J. Physiol., Paris*, 1954, **46**, 507-509. [C.N.R.S., Hautes Études, Fac. Méd., Paris.]

4563

- MADDOCK, C. L. **Chemical studies in experimental scorbutus in cortisone-treated guinea pigs.** *Proc. Soc. Exp. Biol. Med.*, 1954, **85**, 598-600. [Div. Nutrit. Res., Child. Hosp., Boston, Mass.]

It was previously shown (Abst. 587, Vol. 22) that cortisone had no effect on the sequence of events in the production of experimental scurvy or the early recovery from it, as evidenced by gross and histological changes. In the present work it was shown that the sera of guineapigs suffering from uncomplicated scurvy and given or not given cortisone did not differ in their abnormally high content of mucoprotein estimated as tyrosine or as glucosamine. When scorbutic guineapigs were recovering after being given 50 mg. ascorbic acid daily by mouth, the decline to normal of the mucoprotein concentration in the serum was more rapid if cortisone was administered concurrently. Cortisone tended to raise the already high values for serum cholesterol and lecithin in scorbutic guineapigs.—W. Godden.

4564

DESMARAIS, A. Fatigue expérimentale. [Experimental fatigue.] *Laval méd.*, 1954, **19**, 231-242. [Dept. Exp. Physiol., Fac. Med., Laval Univ.]

Tests for measuring fatigue in man are considered, and some experimental results are presented. As criterion, blood lactic acid values are rejected as measuring adaptation to effort rather than fatigue itself. Part of the MacQuarrie test for mechanical ability is considered to be applicable to the purpose.

Groups of white Wistar rats, 9 and 10 in one experiment, 19 and 21 in another, were subjected to 2 or 5 weeks' training by running in a revolving drum. One group in each experiment received 3 daily doses of 50 mg. Na ascorbate by mouth. At the end of training the animals were left to run to exhaustion and were then killed. Those given ascorbate did not become exhausted as soon as those not given it; the mean weights of their thymus glands were 13.7 and 15.5 per cent. less, and the mean succinic dehydrogenase content of the adrenal glands was 18.4 per cent. less (one experiment only). The weight of the adrenal glands was the same.—E. M. Hume.

4565

LANGHAM, M. E. and RIDGE, J. W. The effect of ascorbic acid transfer on the lactic acid concentration of the aqueous humour after unilateral carotid ligation. *J. Physiol.*, 1954, **124**, 26P-27P. [Med. Res. Counc. Ophthalmol. Res. Unit, Inst. Ophthalmol., Judd St., London, W.C.1.]

4566

NADAL, E. M. and MULAY, A. S. Compound E and glycogen deposition in livers of normal and scorbutic guinea pigs. *Federation Proc.*, 1954, **13**, 440. [Nat. Cancer Inst., Bethesda, Md.]

4567

SOKOLOFF, B., EDDY, W. H., BEAUMONT, J. and POWELLA, R. The effect of ascorbic acid and its analog on the PNA/DNA ratio in malignant tissue. *Proc. Amer. Soc. Cancer Res.*, 1954, **1**, 45. [A. P. Cooke Mem. Cancer Lab., Florida S. Coll., Lakeland.]

Experiments with rats.

4568

BOCK, F. G., SARKARIA, D. S. and WILKINS, E. H. The effect of whole body X-radiation on ascorbic acid content of tumors and other tissues of DBA mice. *Proc. Amer. Soc. Cancer Res.*, 1954, **1**, 6. [Roswell Park Mem. Inst., Buffalo, N.Y.]

4569

MITCHELL, W. G. and FLOYD, E. P. Ascorbic acid and ethylene diamine tetraacetate as antidotes in experimental vanadium poisoning. *Proc. Soc. Exp. Biol. Med.*, 1954, **85**, 206-208. [Toxicol. Sect., Div. Occupational Health, U.S.P.H.S., Cincinnati, Ohio.]

4570

VENKATESWARLU, P. and NARAYANA RAO, D. Vitamin C ingestion and skeletal storage of fluorine. *Indian J. Med. Res.*, 1954, **42**, 141-146. [Dept. Biochem., Med. Coll., Trivandrum.]

In feeding experiments with guineapigs, different groups received amounts of ascorbic acid from 0.5 to 25 mg. daily and amounts of F from 1 mg. per kg. bodyweight daily for 44 days to 10 mg. per kg. daily for 21 days. No evidence was obtained of any effect of vitamin C on skeletal storage of F.

W. Godden.

4571

MOORE, W. W. and NALBANDOV, A. V. Ascorbic acid content of the corpora lutea, follicles, and ovaries of swine during the estrous cycle. *J. Animal Sci.*, 1953, **12**, 950. *Proc.* [Univ. Illinois.]

4572

DAVIDOV, R. B. and GUL'KO, L. E. O nekotorykh faktorakh, vliyayushchikh na sodержanie vitamina C v moloche. [Certain factors affecting the vitamin C content of milk.] *Uspekhi Sovrem. Biol.*, 1953, **35**, 457-464. [Moscow.]

Averages for the ascorbic acid content of milk round the year for a group of test animals were from 13 to 16 mg. per litre with range from 7 to 23 mg. The value changed during the day with a maximum in the evening which was 20 per cent. above that in the morning in summer and 50 per cent. above it in winter. The value in winter was from 30 to 40 per cent. higher than in summer. The minimum values recurred in the period from June to August. During the first 2 or 3 months of lactation the value increased and then fell towards the eighth month; during the last month of lactation there was another slight rise. These changes were not seen in animals that were not also pregnant. (From summary.)—W. Hughes.

4573

CHRISTENSEN, E. V. and TERP, P. Om C-vitamin-indholdet i solbørsaft. [The vitamin C content of blackcurrant juice.] *Arch. Pharm. Chem.*, 1954, **61**, 69-90. [Dan. Apot. Kontrollab. Oxford allé Apotek.] English summary.

The fermentation of the sugar during the process of producing blackcurrant juice did not

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lower the vitamin C content. The skin of the fruit should be broken down by a suitable pectinase preparation in order to obtain the ascorbic acid contained in it. Implements of tin, copper and iron, except stainless steel, should be avoided and the action of air reduced to a minimum. With these precautions a juice containing nearly 0.2 per cent. ascorbic acid was produced. The vitamin was best preserved by storage in completely filled bottles; not more than 30 per cent. was then lost in 12 months. Stability was not increased by heating the juice to 100° C. (From summary.)
K. H. Coward.

4574

MINIERI, L. Acido ascorbico totale in alcune ghiande della Campania. (Ricerche col nuovo metodo Tillmans-Ott.) [Total ascorbic acid in some acorns of Campania. Study with the new method of Tillmans and Ott.] *Zootec. Vet.*, 1954, **9**, 104-106. [Ist. Zootec. Gen., Univ. Naples.] French and English summaries.
In some of the central provinces of Italy the

acorns of the common oak and evergreen oak are used in the fattening of pigs and are given to other animals. Ascorbic acid was estimated by indophenol titration in the nuts and cups from oak trees in several localities. The mean value in mg. per 100 g. fresh tissue ranged from 5 to 8 for the acorn nuts and from 16 to 20 for the cups. It is recommended that the cups should be included in the feed in spite of their large content of fibre.

E. M. Hume.

4575

CREAC'H, P. V. and BARAUD, J. L'acide ascorbique total dans les algues marines. [Total ascorbic acid in marine algae.] *C.R. Soc. Biol.*, 1954, **148**, 105-107. [Lab. Biochim., Inst. Sci. Pêches Maritimes.]

With the method previously described (Abst. 556, Vol. 22), a number of different species of green, brown and red seaweeds were analysed for total ascorbic acid. The amount found ranged from 2.76 to 135.0 mg. per 100 g. fresh tissue or from 46.3 to 515.0 mg. per 100 g. dry matter.

W. Godden.

OTHER VITAMINS

4576

FASSBENDER, H. G. and PIPPERT, H. K. Die allergisch-hyperergische Entzündung von Haut und Gelenken unter dem Einfluss von Hyaluronidase und Rutin. [Effect of hyaluronidase and rutin on allergic-hyperergic inflammation of skin and joints.] *Ztschr. ges. exp. Med.*, 1954, **123**, 210-218. [Pathol. Inst., Johannes-Gutenberg-Univ., Mainz.]

4577

HENCKEL, C. El complejo vitamínico T (Goetsch). [The vitamin T complex (Goetsch).] *Rev. méd.*

Chile, 1953, **81**, 623-624. [Inst. Histol., Univ. Concepción, Chile.]

When a vitamin T preparation was given to 25 chicks for 5 weeks their weight rose to 283.8 g. while that of a similar group having the same normal mash with no supplement rose only to 212.7 g. Secondary sex characters developed more rapidly in the chicks given vitamin T. The probable nature of the vitamin T complex is discussed with reference to the recent report of Wacker *et al.* (Abst. 4927, Vol. 21).

A. M. Copping.

4. PHYSIOLOGY OF NUTRITION

ENZYMES

4578

SANDSTEDT, R. M. and GATES, R. L. Raw starch digestion: a comparison of the raw starch digesting capabilities of the amylase systems from four alpha-amylase sources. *Food Res.*, 1954, **19**, 190-199. [Coll. Agric., Univ. Nebraska, Lincoln.]

4579

TOLCKMITT, W. Zur Frage des Magenkathepsins. [Stomach cathepsin.] *Biochem. Ztschr.*, 1954, **325**, 389-400. [I. Klin. Med., Univ. Hamburg, Eppendorf.]

The curves of proteolytic activity of gastric

juice, with acetic, lactic, tartaric and hydrochloric acids and 2 buffer solutions, in every case, over the pH range used by Buchs, had a single peak. Buchs in his experiments used HCl up to pH 2.2 and acetic acid for the higher range, and the depression in his curve occurs exactly at the point where acetic acid was introduced into the pH scale. The double peak obtained by Buchs may be due to his use of 2 different acids, and not, as he infers (*Die Biologie des Magenkathepsins*, 1947, S. Karger Verlag, Basle) to the presence of 2 different enzymes. The presence of a catheptic stomach enzyme cannot yet be regarded as certain.

M. B. Richards.

4580

BUCHS, S. Über das Duodenalpepsin und das Duodenalkathepsin der Tiere. [**The duodenal pepsin and duodenal cathepsin of animals.**] *Pflügers Arch.*, 1953-54, **258**, 304-310. [Kind-erlin., Univ. Basle.]

Extracts of upper duodenal mucosa from cats, cattle, dogs and pigs showed pH activity curves similar to those of gastric juice or extracts of gastric mucosa. All 3 curves showed a double peak. Proteolysis occurred from pH 1 to about pH 4. The digestion of the substrate is ascribed to pepsin and cathepsin in the duodenal mucosa.

M. B. Richards.

4581

BOTHWELL, J. W. and WILLIAMS, J. N. (Jr.) **Effects of a lysine deficiency upon enzyme activity in rat liver.** *Proc. Soc. Exp. Biol. Med.*, 1954, **85**, 544-547. [Dept. Biochem., Coll. Agric., Univ. Wisconsin, Madison.]

Male weanling rats were fed, either to appetite or forcibly by stomach tube, on an amino-acid diet with or without lysine. When animals showed signs of lysine deficiency they and corresponding controls were killed and some enzyme activities of the liver were measured. The endogenous respiration was unaffected by lysine deficiency; the activity of xanthine oxidase per g. liver N decreased to about 60 per cent. of that of controls, and succinic oxidase and choline oxidase to about 71 per cent. The reduction of activity was similar for animals fed forcibly or at will, even though the latter ate less of the lysine-deficient diet. The results are compared with those of earlier work (Absts. 4910, Vol. 19; and 3593, Vol. 21) which showed that methionine deficiency almost abolished, but histidine deficiency had no effect on, xanthine oxidase activity.—C. Warner.

4582

LITWACK, G., FATTERPAKER, P., WILLIAMS, J. N. (Jr.) and ELVEHJEM, C. A. **Studies on the response of liver xanthine oxidase to dietary protein in weanling rats.** *J. Nutrition*, 1954, **52**, 187-197. [Dept. Biochem., Univ. Wisconsin, Madison.]

The experiments described in Absts. 473 and 4592, Vol. 23 are here extended to the study of enzyme response and growth response in the same animals. Enzyme and growth results agreed fairly closely when casein, lactalbumin, gliadin or a maize and soya mixture was the source of protein. Autoclaving with dilute alkali to destroy vitamin B₁₂ enhanced the xanthine oxidase response greatly and the growth response less. The enzyme responses to casein, alkali-treated casein and gliadin were slightly increased when vitamin B₁₂ was included in the diet. The addition of

molybdate to the lactalbumin diet had no effect on the enzyme response.—C. Warner.

4583

DIETRICH, L. S. **Effect of xanthine administration on xanthine oxidase activity of mouse tissues.** *Federation Proc.*, 1954, **13**, 455. [Dept. Biochem., Coll. Phys. Surg., Columbia Univ., New York.]

4584

WAINIO, W. W., ALLISON, J. B., EICHEL, B., PERSON, P. and ROWLEY, G. R. **Enzymes in protein depletion. 2. Oxidative enzymes of heart ventricle.** *J. Nutrition*, 1954, **52**, 565-573. [Bur. Biol. Res., Rutgers Univ., New Brunswick, N.J.]

For part 1 see Abst. 4431, Vol. 23. The diets and treatment of the rats resembled those in the previous experiment.

The activities of succinic dehydrogenase, DPN-cytochrome c reductase and cytochrome oxidase in heart muscle were not significantly affected by protein depletion or by food restriction. Total enzyme activity was directly related to the amount of total protein in the heart, in contrast to the condition in the liver reported earlier.

D. Duncan.

4585

RINDI, G. **Comportamento della glutamico-ossalacetico transaminasi di tessuti di ratto in seguito a surrenectomia e a trattamento con ormoni corticosurrenali.** [**Behaviour of glutamic-oxaloacetic transaminase in the tissues of rats after adrenalectomy and treatment with adrenal cortical hormones.**] *Arch. Sci. biol., Bologna*, 1954, **38**, 155-171. [Ist. Fisiol. Umana, Univ. Pavia.]

Adrenalectomy in the rat reduces the activity of the glutamic oxaloacetic transaminase of the heart, muscle and brain, but does not significantly affect that of the liver. Injections of cortisone restore to normal the transaminase activity of heart and brain, and raise above normal that of muscle and liver. Deoxycorticosterone acetate (DOCA) has no influence on the glutamic-oxaloacetic transaminase of liver, heart and brain, but restores to normal that of the muscle. In the normal rat cortisone increases only the glutamic transaminase of the liver, leaving that of the other tissues unaltered; DOCA has no clear action on any of the tissues studied, although it tends to reduce the transaminase activity of the liver.

M. B. Richards.

4586

GREENBAUM, A. L. and GREENWOOD, F. C. **Some enzymic changes in the mammary gland of**

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rats during pregnancy, lactation and mammary involution. *Biochem. J.*, 1954, **56**, 625-631.

[Dept. Biochem., University Coll., London.]

Nine groups of rats were used; 3 were killed on the 10th, 15th and 20th days of pregnancy, 4 on the 5th, 10th, 15th and 20th days of lactation and 2 on the second and fourth days of involution of the mammary gland after removal of the young at 21 days of age.

Glutamic dehydrogenase activity in the mammary gland rose significantly in the last third of pregnancy, remained high during lactation and fell steeply during involution. It was about one-tenth that of liver. For glutamic-aspartic transaminase activity there was during pregnancy a slow increase, at parturition a rise to a high level which was maintained throughout lactation and during involution a rapid decrease. The activity was about one-third that of liver. Cathepsin activity increased only slightly during pregnancy but rose steadily during lactation, and the rise continued during involution. It was greater than in any other tissue and twice that for lymph nodes, the most active tissue recorded. β -Glucuronidase activity rose sharply between the 15th and 20th days of pregnancy, fell during lactation and rose to its highest level during involution. It was about one-third that of liver.

The results are discussed in relation to changes that may occur in the mitochondria during the lactation cycle.—D. Harvey.

4587

PICCINNI, L. and MONTELLA, G. La lipasi ematica nella calcolosi delle vie biliari. [Blood lipase in patients with biliary calculi.] *Arch. ital. Malat. Appar. diger.*, 1954, **20**, 161-164. [Ist. Clin. Chirurg. Gen., Univ. Bologna.]

Blood lipase was estimated by a modification of the Rona Michaelis method in 20 patients suffering from biliary calculi. Amounts above normal were found in 7. Lipase estimation is considered a useful test for revealing possible involvement of the pancreas in such cases, especially if serum and urinary amylase are estimated at the same time.

M. B. Richards.

4592

SCHÄFER, H. and WERNER, E. Vergleichende röntgenologische Dünndarmuntersuchungen bei gesunden Säuglingen mit verschiedenen Nahrungen. [Comparative X-ray studies of the small intestine of healthy infants on different diets.] *Ztschr. Kinderheilk.*, 1954, **74**, 439-453. [Kinderklin., Freie Univ., Berlin.]

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4588

MORRISON, M. A., McLAREN, B. A. and STADELMAN, W. J. Characteristics of a fatty acid oxidase from adipose tissue of the hen. *Poultry Sci.*, 1954, **33**, 401-406. [Agric. Exp. Stat., State Coll. Washington, Pullman.]

Adipose tissue was taken from the backs, thighs and visceral cavities of hens. The fat was expressed from the tissue and the residue was homogenised in a phosphate/MgSO₄ buffer. The capacity of the preparation to oxidise fatty acids was tested in a Barcroft Warburg apparatus.

The enzyme system was inactive before it was incubated at 37° C. for 18 to 24 hr. The incubated preparation, after filtration, oxidised octanoic, myristic, palmitic, stearic, oleic and linoleic acids. Oxidation was completely inhibited by NaCN, hydroxylamine hydrochloride and arsenite; malonate and K ferricyanide had no effect. Oxidation was partly inhibited by Na azide and Na diethyldithiocarbamate. The anti-oxidants nordihydroguaiaretic acid and propyl gallate slightly reduced the oxygen uptake in the oxidising system when oleic and myristic acids were the substrates.

G. A. Garton.

4589

WAKIL, S. J. and MAHLER, H. R. Studies on the fatty acid oxidizing system of animal tissues. 5. Unsaturated fatty acyl coenzyme A hydrazine. *J. Biol. Chem.*, 1954, **207**, 125-132. [Inst. Enzyme Res., Univ. Wisconsin, Madison.]

4590

YANG, C. S. and OLSON, R. E. Effect of dietary hepatic necrosis in rats upon liver coenzymes. *Federation Proc.*, 1954, **13**, 483. [Dept. Biochem., Grad. Sch. Pub. Health, Univ. Pittsburgh, Pa.]

4591

KUNKEL, H. O., FUTRELL, M. F. and LYMAN, C. M. Relationship of serum alkaline phosphatase activities to rates of gain in Brahman cattle. *Federation Proc.*, 1954, **13**, 463-464. [Dept. Biochem., Texas Agric. and Mech. Coll. System, College Station.]

See also Absts. 4915, 5064.

DIGESTION AND ABSORPTION

X-ray examinations numbering 63 were made of the small intestines of infants aged 14 days to 1 year, the BaSO₄ being mixed with different diets such as tea, human milk, two-thirds milk, buttermilk, mixed human and buttermilk, gruels and vegetable soups. For any one food there was close similarity among the infants in the X-ray pictures obtained, but distinct differences were obtained with different food mixtures. Tables are

given showing the nature of the picture obtained and times of passage for the different diets. The line between normal and pathological X-ray findings in the small intestine must not be drawn too sharply; a certain amount of variation is to be regarded as physiological. Some of the findings reported in the literature as pathological have in the present investigation been found in healthy infants.—M. B. Richards.

4593

ENTICKNAP, J. B. and MERIVALE, W. H. **The value of clinical laboratory tests. 6. The fractional test meal.** *Guy's Hosp. Rep.*, 1954, **103**, 35-42. [Dept. Clin. Pathol.]

4594

OLSON, W. H. and BRIDGWATER, A. B. **Nocturnal and insulin gastric secretion.** *J. Amer. Med. Assoc.*, 1954, **154**, 977-981. [Dept. Gastro-Intestinal Res., Med. Res. Inst., Michael Reese Hosp., Chicago, Ill.]

Secretion of gastric juice during 12 night hours did not differ in patients with duodenal ulcer from that in normal subjects in a penitentiary, nor was there any difference in response to the Hollander insulin test. Penitentiary subjects secreted more, and more acid, gastric juice and excreted more uropepsin than normal subjects in general. Normal subjects and those with duodenal ulcer in the penitentiary did not differ in uropepsin production or peptic activity of night gastric juice.—I. Leitch.

4595

PATHAK, J. D. and PAI, M. L. **Gastric response, digestion and evacuation time of some vegetarian foods. 2.** *Indian J. Med. Res.*, 1954, **42**, 43-49. [Dept. Physiol., Med. Coll., Baroda.]

The methods of study were described previously in a report on milk and milk products (Pathak, Pai and Gandhi, *Indian J. Med. Res.*, 1953, **41**, 17). [This part not reviewed here.] Data are tabulated for digestion and evacuation from the human stomach of some common preparations of cereals, pulses and groundnuts.—F. C. Aitken.

4596

CAROTTI, A. Studio della secrezione gastrica dopo "stimolazioni" con antiistaminici. [Gastric secretion after "stimulation" with antihistamines.] *Arch. ital. Malat. Appar. diger.*, 1954, **20**, 41-47. [Ist. Clin. Med. Gen., Univ. Perugia.]

4597

BRUMMER, P. and YLI-POHJA, M. **On the significance of peptic digestion.** *Acta med. scand.*, 1954, **148**, 239-244. [Med. Clin., Turku Univ.] The glycine test was used to test peptic digestion

in 21 subjects suffering from achlorhydria, in 20 subjects after subtotal gastrectomy and in 20 normal subjects. The test consists in administering 1.5 g. gelatine in 30 ml. warm water per kg. bodyweight. Venous blood is collected after 2, 3 and 4 hr. and the plasma glycine content is estimated.

No difference was found in the rise in plasma glycine between the achlorhydric group and the controls. Subjects in whom subtotal gastrectomy had been performed showed a somewhat greater rise in plasma glycine. The results indicate no difference in protein digestion in subjects suffering from achlorhydria. The increased response after subtotal gastrectomy is probably due to a more rapid emptying of the stomach, so that the gelatine comes into contact with trypsin more rapidly than normal.—A. T. Phillipson.

4598

ARUTYUNYAN, L. A. Vliyanie myasa raznoi stepeni sozrevaniya na sekretornuyu funktsii zheludka. [Influence of meat of varying degrees of ripeness on the secretory and motor functions of the stomach.] *Vop. Pitani.*, 1954, **13**, No. 2, 20-25. [Kaf. Vet.-Sanit. Eksp., Erevansk. Zootekh.-Vet. Inst.]

The secretory and motor responses of the stomach were studied in dogs with Pavlov pouches, fed on meat hung for different periods. With increasing ripeness of the meat the delay before secretion began was less; the quantity of juice produced in the first 3 hr. rose steadily and then decreased. The digestive power of the juice fell, but total acidity and free HCl rose. The stomach emptied earlier.—D. W. Taylor.

4599

GAEHLINGER, H. Quelques remarques sur les fermentations et la flore intestinale. [Fermentations and intestinal flora.] *Acta gastroenterol. belg.*, 1954, **17**, 130-137. *Proc.* [Chatel-Guyon.] Dutch and Portuguese summaries.

4600

PALOHEIMO, L., MÄKELÄ, A. and SALO, M. L. **Some observations on the transport of food in the alimentary canal of the rat.** *Maataloust. Aikakausk.*, 1954, **26**, 1-9. [Dept. Animal Husb., Univ. Helsinki.] Finnish summary.

Work on the transit of food through the digestive tract of simple-stomached mammals is briefly reviewed.

Adult rats of both sexes were given an experimental meal of dried wheat bread containing milk, sugar, cocoa fat, yeast and salt. The size of the meal was positively correlated with the amount removed from the stomach in the first 3 hr.

In rats killed 5 min. after beginning to feed, food had already traversed about 60 per cent. of the small intestine, but the rate of passage then declined sharply, and passage through the ileo-caecal valve did not occur until 90 min. after the start of the meal.

The results do not support the classical concept of peristalsis as expressed by Bayliss and Starling. D. Duncan.

4601

RAMPONE, A. J. and ANNIGERS, J. H. **Transport of absorbed dietary fat from intestine of the dog.** *Federation Proc.*, 1954, **13**, 115. [Dept. Physiol., Northwestern Univ. Med. Sch., Chicago, Ill.]

4602

LE BARS, H., NITESCU, R. and SIMONNET, H. *Recherches sur la motricité du rumen chez les petits ruminants. [Investigation of the motility of the rumen in small ruminants.]* 1. Motricité normale. [1. Normal motility.] 2. Relation entre la motricité et la glycémie. [2. Relation between motility and blood sugar.] 3. Action de l'adrénaline. [3. Action of adrenaline.] *Bull. Acad. vét. France*, 1953, **26**, 287-300; 351-360; 445-447. [Lab. Physiol., École Nat. Vét., Alfort.]

1. The movements of the rumen in adult sheep were recorded graphically from a portion of the rumen brought by operation into permanent adherence to the overlying skin, or by creation of a rumen fistula through which a balloon could be introduced. The methods gave concordant results. The tracings obtained are reproduced.

As soon as the animal began to masticate its feed, whatever the feed might be, the normal contractions of the rumen at rest became more rapid; when eating ceased they became slow again. During rumination the frequency of contraction was intermediate between that of eating and that of rest. At the moment of regurgitation the rumen did not contract, but it contracted as soon as mastication began. Eructation of gas was always accompanied by two contractions close together.

2. The changes in blood sugar in relation to the contractions of the rumen were studied by the method with a rumen fistula; glucose or insulin was given intravenously. It is clear, when allowance was made for a certain latent period, that high blood sugar inhibited contraction of the rumen and low blood sugar promoted it.

3. By the same methods, intravenous injection of adrenaline was found to cause immediately almost total inhibition of contraction lasting for 1 or 2 min.; for the next 2 min. contraction returned, but inhibition then set in again and lasted for about 3 hr.—E. M. Hume.

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4603

WELLER, R. A. and GRAY, F. V. **The passage of starch through the stomach of the sheep.** *J. Exp. Biol.*, 1954, **31**, 40-48. [Div. Biochem., C.S.I.R.O., Univ. Adelaide, S. Austral.]

The quantities of polysaccharide estimated as starch passing to the abomasum were calculated from the starch:lignin ratios of the ruminal and abomasal contents. When sheep received diets containing from 3 to 149 g. starch it was estimated that from 1 to 8 g. passed through the abomasum in 24 hr.

Some evidence is presented which suggests that of the total polysaccharide material estimated as starch about two-thirds was contained in the protozoa. Counts of the protozoa in the different parts of the stomach show that they are much reduced in numbers in the omasal contents. Microscopic examination of omasal contents revealed signs of death of those organisms in the omasum.—A. T. Phillipson.

4604

GRAY, F. V., PILGRIM, A. F. and WELLER, R. A. **Functions of the omasum in the stomach of the sheep.** *J. Exp. Biol.*, 1954, **31**, 49-55. [Div. Biochem., C.S.I.R.O., Univ. Adelaide, S. Austral.]

Lignin and total dry matter are concentrated in the omasum. This could be due to contraction of the organ and pressure of the liquid part of the digesta into the abomasum or reticulum, but examination of the nitrogen:lignin ratio of the digesta in different parts of the stomach did not support this view. The ratio is greater in the reticulum digesta than in the omasal and abomasal digesta, in which it is similar. This indicates not only that little fluid is expressed from the omasum, but also that little direct passage from the reticulum to the abomasum occurs. On the assumption that both are of negligible proportions it is calculated from the lignin concentrations that 33 to 64 per cent. of the water entering the omasum is absorbed. The fatty acid:lignin ratios show that 40 to 69 per cent. of these acids entering the omasum are absorbed.—A. T. Phillipson.

4605

CASON, J. L., RUBY, E. S. and STALLCUP, O. T. **The influence of the ash content of the rumen ingesta on the hydrogen ion concentration in the bovine rumen.** *J. Nutrition*, 1954, **52**, 457-465. [Dept. Animal Indust., Univ. Arkansas, Fayetteville.]

Three varieties of hay were given to steers with rumen fistulae. The pH, total fat, fatty acids and ash content of the rumen digesta were estimated. A positive but not significant correlation was found between the pH and the fatty acid content

of the digesta, and a strong positive correlation between the pH and the ash content.

A. T. Phillipson.

4606

HEGLAND, R. B., JACOBSON, N. L. and PAYNE, L. C. **Factors affecting reflex closure of the esophageal groove in the calf.** *J. Animal Sci.*, 1953, **12**, 947. *Proc.* [Iowa State Coll.]

4607

ALEXANDER, F. **A review of knowledge available concerning digestion in domestic herbivora. 1. 2.** *Brit. Vet. J.*, 1954, **110**, 146-152; 196-204. [Dept. Vet. Pharmacol., Royal (Dick) Sch. Vet. Studies, Univ. Edinburgh.]

4608

BENTLEY, O. G., JOHNSON, R. R. and MOXON, A. L. **Factors influencing cellulose digestion by rumen microorganisms in vitro.** *Federation Proc.*, 1954, **13**, 182. [Dept. Animal Sci., Ohio Agric. Exp. Stat., Wooster.]

4609

RADISSON, J. J., BARTLEY, E. E., FOUNTAINE, F. C. and ATKESON, F. W. **Effect of aureomycin and/or grass juice concentrate on cellulose digestion in an artificial rumen, as influenced by different sources of nutrients.** *J.*

Animal Sci., 1953, **12**, 929. *Proc.* [Kansas State Coll.]

4610

BROOKS, C. C., GARNER, G. B., MUHRER, M. E. and PFANDER, W. H. **The effect of fat and diethylstilbestrol on cellulose digestion by sheep rumen microorganisms.** *J. Animal Sci.*, 1953, **12**, 909. *Proc.* [Univ. Missouri.]

4611

GALL, L. S., HUHTANEN, C. N., SAUNDERS, R. K., BJERKNES, C. A. and DAVIS, L. R. **Time studies of rumen changes during a 16-hour fast.** *J. Animal Sci.*, 1953, **12**, 916. *Proc.* [Nat. Dairy Res. Labs.]

4612

PARSONS, A. R., WHITEHAIR, C. K. and NEUMANN, A. L. **Bloat and rumen motility as affected by forage extracts and other related substances.** *J. Animal Sci.*, 1953, **12**, 926-927. *Proc.* [Univ. Illinois.]
Experiments with cows.

4613

NICHOLS, R. E., MOORE, W. E. C. and DILLON, R. D. **A note on the effective buoyancy of rumen juice of cattle fed hay, grass and legumes.** *J. Animal Sci.*, 1953, **12**, 952. *Proc.* [Univ. Wisconsin.]

COMPOSITION OF BODY FLUIDS AND TISSUES

BLOOD

4614

GOTTFRIED, S. P., BOGIN, M. and LEVYCKY, N. V. (Jr.) **Blood and electrolyte studies on normal newborn full-term babies.** *Amer. J. Dis. Child.*, 1954, **87**, 543-547. [Biochem. Lab., Bridgeport Hosp., Conn.]

4615

GANGULI, N. C. **Observations on the blood picture during normal pregnancy.** *J. Indian Med. Assoc.*, 1954, **23**, 332-335. [Dept. Pathol., N.R. Sarkar Med. Coll., Calcutta.]

Hb, red and white cell counts, differential leucocyte counts and erythrocyte sedimentation rate were estimated in 74 pregnant women and 20 non-pregnant controls. Group average results are tabulated, including results for the pregnant women grouped according to parity, age and stage of pregnancy.

Hb and red cell count were lower in pregnant than in non-pregnant women. White cell count and erythrocyte sedimentation rate were raised in pregnancy and increased as pregnancy advanced.

F. C. Aitken.

4616

HAGEN, A., LARSEN, V. and LASSEN, N. **Haemoglobinprocenten hos normale gravide efter injection af kolloidalt jernsaccharat. [Haemoglobin percentage in normal pregnant women after injection of colloidal iron saccharate.]** *Nord. Med.*, 1954, **51**, 609-611. [Rigshosp., Copenhagen.] English summary.

4617

GREATOREX, J. C. **Studies on the haematology of calves from birth to one year of age.** *Brit. Vet. J.*, 1954, **110**, 120-138. [Dept. Med., Royal Vet. Coll., Streatley-on-Thames.]

4618

MERRILL, W. G. and SMITH, V. R. **A comparison of some cellular and chemical constituents of blood at time of parturition and after administration of adrenocorticotrophin.** *J. Dairy Sci.*, 1954, **37**, 546-551. [Dept. Dairy Husb., Univ. Wisconsin, Madison.]

4619

HATHOOT, A. F. **The study of normal blood of sheep.** *Indian J. Vet. Sci.*, 1953, **23**, 269-272. [Dept. Vet. Med., Fac. Agric., Univ. Cairo.]

Data for newborn lambs and for adult sheep were: red blood cells 10.93 and 8.59 million per c.mm.; Hb 70.5 and 54.0 per cent.; white blood cells 10.0 and 8.0 thousand per c.mm.; differential count, neutrophils 64.5 and 41.0, lymphocytes 44.0 and 50, eosinophils 0.2 and 5.7, basophils 0.1 and 0.3 and monocytes 1.2 and 3.0 per cent.

J. S. Thomson.

4620

STEINBECK, A. W. **Plasma and blood volumes of normal Australian females.** *Austral. J. Exp. Biol. Med. Sci.*, 1954, **32**, 95-99. [Dept. Med., Univ. Sydney.]

Plasma volume was estimated by the T-1824 method in 35 normal women; details of technique were as before (Abst. 533, Vol. 21). Results from a 30-min. disappearance curve did not differ significantly from those from a full disappearance curve. Individual results are tabulated and linear regression equations are given for plasma volume on bodyweight, height, surface area, and bodyweight and height. Mean values were 48.23 ± 0.87 (S.E.) ml. per kg. bodyweight, 16.70 ± 0.34 ml. per cm. height and 1.687 ± 0.265 litre per sq.m. surface. When plasma volume was re-estimated in 6 of the subjects after 6 months, the results were close to the original values.

W. M. Deans.

4621

BURKE, J. D. **Blood volume in mammals.** *Physiol. Zool.*, 1954, **27**, 1-21. [Univ. Florida.]

Blood volume was estimated with red blood cells labelled with ^{32}P and with T-1824. Red cells were counted and Hb concentration was measured.

In 14 opossums, *Didelphis virginiana pigra*, values for total plasma volume, total red cell volume and total blood volume were somewhat higher by the dye method. Withdrawal of serial samples showed that mixing was complete within 1 min. of injection for both methods. Within an hour the percentage of dye in the blood had decreased to 79.8, and of radio-activity to 80.8. Blood volume was estimated also in 10 Duroc-Jersey pigs of different weights; mixing was complete in 10 min. The mean values in ml. blood per 100 g. bodyweight by the dye and radio-active methods, respectively, were 5.83 and 5.49 for the opossums and 8.16 and 7.96 for the pigs. The blood volume relative to bodyweight within the species was less as bodyweight increased; the relative blood volume in young animals was thus greater than in older ones.

Values from the literature are tabulated for many animals.—E. M. Hume.

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4622

STANIER, M. W. and THOMPSON, M. D. **The serum protein levels of newborn African infants.** *Arch. Dis. Childhood*, 1954, **29**, 110-112. [Dept. Physiol., Makerere Coll., Kampala, Uganda.]

Two sets of data are presented for serum proteins as measured by the Antweiler micro-electrophoretic apparatus.

The first gives means and ranges for 14 samples of cord blood and for 10 of maternal blood. For cord blood the level of albumin was above and the levels of β - and γ -globulin were below those for maternal blood by amounts statistically significant. For comparison with white subjects the data of Longworth *et al.* (Title 14, Vol. 15) are quoted. In the cord blood of Africans levels of albumin and β -globulin were considerably lower and in maternal serum all proteins except γ -globulin were also significantly lower than in the American samples. The γ -globulin in African mothers' was about twice that in white mothers' blood.

The second set of data refers to 5 infants whose cord blood was analysed and from whom blood samples were obtained at 8, 9 and 12 days and 12 weeks and 12 weeks, respectively. No increase in γ -globulin was found in these infants during early life.—D. Harvey.

4623

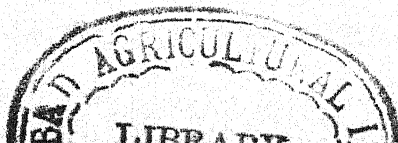
JASO, E., ITURRIAGA, E. and ROLDÁN, A. **Alteraciones de las proteínas plasmáticas en el curso de los trastornos [? trastornos] nutritivos del lactante. [Changes in plasma proteins during digestive disturbances in the infant.]** *Rev. española Pediat.*, 1954, **10**, 213-220. [Madrid.] French, English and German summaries.

Protein fractions were estimated, by the method of free electrophoretic migration in Kern's apparatus, in plasma of 17 infants, 9 suffering from toxicosis and 8 from dystrophy. In both groups there was a distinct increase in the α -globulin fraction, especially in the α_2 -form, and in γ -globulin, the increase in the latter being more marked in the dystrophic. Such changes are attributed to a hepatic lesion in the state of toxicosis, which affects both the hepatic cell and the interstitial tissue. In dystrophy the protein syndrome corresponds to that of chronic malnutrition.

M. B. Richards.

4624

CAREDDU, P. and VULLO, C. **Risultati di indagini elettroforetiche e di prove immunitarie e di labilità colloidale nell'anemia mediterranea. [Results of electrophoretic study and of tests of immunity and of colloid lability in Mediterranean anaemia.]** *Riv. Ist. sieroterap. ital.*, 1954, **29**, 182-189. [Clin. Paediat., Univ. Sassari.] English summary.



In 20 children with Cooley's (Mediterranean) anaemia total serum protein was normal, albumin low except in 6, γ -globulin high in all but 1 and the albumin:globulin ratio was reversed. There was no evidence of immunological abnormality.—I. Leitch.

4625

BUSSON, F., TRAPET, P. and LECOCQ, F. Exploration des protéines sériques. Application aux sérums d'Africains de Dakar. [Investigation of serum proteins. Application to serum of Africans in Dakar.] *Méd. trop.*, 1953, 13, 977-1001. [Org. Enquête Étude Anthropol. Pop. Indigènes A.O.F. Aliment. Nutrit.]

Methods are reviewed for fractionating serum proteins, and a detailed description is given of electrophoretic, paper chromatography and spectrophotometric methods used by the authors. Spectrophotometric estimations were usually made because the method was rapid, but the results, especially those from abnormal sera, were frequently checked against those obtained by electrophoresis.

Values for Europeans and Africans are given; those for Africans showed the expected high value for total serum protein, a moderately low one for albumin and a greatly increased one for γ -globulin, compared with findings for Europeans. The mean albumin:globulin ratio for 48 healthy Europeans was 1.23 with S.D. 0.16, and for 375 apparently healthy Africans 0.78 with S.D. 0.17. Serial studies still in progress suggested a seasonal variation in the serum proteins of Africans.

L. Wills.

4626

ARENS, L. and BROCK, J. F. Some aspects of the serum protein pattern of Africans. *S. African J. Clin. Sci.*, 1954, 5, 20-34. [Dept. Med., Univ. Cape Town.]

The methods used by Holmes *et al.* (Abst. 678, Vol. 22) in Kampala were employed in Cape Town to study the serum proteins of 100 African labourers; "liver function" turbidimetric tests were also made on some of the subjects. Twenty healthy Europeans in Cape Town acted as controls for comparison with these Africans and with the Europeans in the Kampala study. In addition blood samples were obtained from 65 Africans in South-West Africa and Southern Rhodesia, both areas of endemic tropical disease; the 7 subjects in Rhodesia were known to have schistosomiasis.

For the data for Europeans no statistical comparison was possible, but results appeared comparable with those obtained by Holmes and co-workers. For the Africans in Cape Town total protein, albumin, total and β -globulin were higher and α - and γ -globulin lower on the average than for Kampala Africans. Comparison of the Africans

with the Europeans in Cape Town showed significant differences in all protein fractions. The Europeans could be regarded as healthy, but the Africans were only apparently so. By a more strict selection which excluded those with abnormal red blood sedimentation rates or turbidity reactions the Africans were reduced to a group of 9 "rigorous normals", but the values for them, although nearer those for Europeans, were in most respects outside the European range. In general the results of the liver function tests showed abnormality for the Africans and were negative for the Europeans.

It is concluded that, while the presence of parasitic infestation may to some extent account for these differences between the serum protein fractions in Africans and Europeans, prolonged protein malnutrition and latent liver disease may also be responsible.—D. Harvey.

4627

OEFF, K. Umsatz von radioaktiven Serum-eiweissfraktionen. 1. Methodische Grundlagen. 2. Versuche an normalen Ratten. [Turnover of radio-active serum protein fractions. 1. Technical principles. 2. Experiments on normal rats.] *Ztschr. ges. exp. Med.*, 1954, 123, 294-308; 309-314. [Med. Klin., Freie Univ., Berlin.]

1. To investigate the turnover of the separate protein fractions in human and animal sera, ^{131}I was used to label proteins. The procedure is described in detail.

2. The activity of serum and its protein fractions was studied in rats after injection of rat serum labelled with ^{131}I . The curves of the fall of activity in total protein and in separate fractions showed 2 phases, the rapid fall in the first phase representing the mixing of the injected protein molecules with the extravascular protein reserve. The half-life of injected protein was 3 to 5 hr. The ratio of extravascular to intravascular protein was approximately 4:1. The second phase of the curves represented the rate of turnover of the proteins. The half-life of total serum protein was 2.4 days, of albumin 2.7 days, and of separate globulin fractions 2.0 to 2.4 days. The daily turnover of plasma protein was calculated to be about 0.76 g.—M. B. Richards.

4628

KROETZ, C. and FISCHER, F. W. Zur Blutchemie der akuten fortschreitenden Arteriosklerose. Elektrophoretische Lipoproteinbestimmungen bei Atheromatose und Atherosklerose. [Blood chemistry in acute progressive arteriosclerosis. Electrophoretic estimation of lipoprotein in atheroma and atherosclerosis.] *Deutsch. med. Wochenschr.*, 1954, 79, 653-657. [Allg. Krankenhaus Barmbek, Hamburg.]

N.A. and R., October 1954

A simple method is described by which serum lipoproteins were separated by paper electrophoresis, stained with oil-red O and estimated colorimetrically. The lipoprotein picture was compared with the serum protein picture in circulatory disorders. Observations were made on normal subjects and on 166 patients with early acute cardiac infarction, 52 with threatened or receding cardiac infarction, 68 with slowly advancing softening of the brain and 22 with diabetes.

The blood protein picture was confused in acute progressive arteriosclerosis, but the lipoprotein picture was characteristic, particularly in the transference of lipid from α_1 - to β -protein, as shown by the high β -lipoprotein and low α_1 -lipoprotein levels and high $\beta : \alpha_1$ ratio, which were not accompanied by corresponding changes in the globulins. All the groups of patients showed these changes, but, if this method is used for diagnosis of early arteriosclerosis, liver disease must be excluded.

D. Duncan.

4629

BEISCHER, D. E. **Electron microscopy of human plasma lipoprotein separated by ultracentrifugation.** *Circulation Res.*, 1954, 2, 164-168. [Dept. Res., U.S. Naval Sch. Aviation Med., U.S. Naval Air Stat., Pensacola, Fla.]

4630

ESCOBAR, C. and MÉNDEZ, J. Estudios microelectroforéticos de las proteínas séricas en grupos normales de la Ciudad de Guatemala y en diversos casos patológicos. [Microelectrophoretic studies of serum proteins in normal subjects from Guatemala City and in different pathological cases.] *Bol. Ofic. sanit. panamer.*, 1953, 35, 17-25.

4631

SCRIMSHAW, N. S., GUZMÁN, M. and MÉNDEZ, J. Interpretación de los valores proteicos del suero humano en la América Central y Panamá. [Interpretation of data on human serum protein values in Central America and Panama.] *Bol. Ofic. sanit. panamer.*, 1951, 30, 672-685.

4632

MÉNDEZ, J., GUZMÁN, M. and AGUIRRE, F. Niveles de vitaminas y proteínas, valores hematológicos y hallazgos parasitológicos en diversos grupos de población. [Serum levels of vitamins and protein, haematological values and parasitological findings in different groups of the population.] *Rev. Col. Méd., Guatemala*, 1951 [? 1952], 3, 17-23.

4633

INUTSUKA, S. and KAWACHI, T. Fluctuation de la concentration de la protéine dans le sérum

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du sang après l'exercice physique. [Fluctuations in the concentration of protein in the blood serum after physical exercise.] *Kyushu Mem. Med. Sci.*, 1953, 3, 253-260. [Fac. Med., Univ. Kyushu.]

4634

KAZMEIER, F. and GASSEN, A. Untersuchungen über die Papierchromatographie von menschlichem Serumweiß. [Paper chromatography of human serum protein.] *Klin. Wochenschr.*, 1954, 32, 81-85. [2. Med. Klin., Med. Akad., Düsseldorf.]

4635

FISCHER, M. A. **Serum proteins of choline-deficient rats—effect of an L-cystine supplement.** *Federation Proc.*, 1954, 13, 208. [Biochem. Dept., Sch. Med., Univ. Pittsburgh, Pa.]

4636

SCANU, A. Curve di frazionamento salino delle proteine sieriche con il metodo dell'iposolfito sodico. 2. Sieri umani patologici. [Saline fractionation curves of serum proteins by the sodium hyposulphite method. 2. Pathological human sera.] *Riv. Ist. sieroterap. ital.*, 1954, 29, 59-71. [Ist. Patol. Spec. Med., Univ. Naples.] English summary.

For Part 1 see Abst. 2743, Vol. 24.

4637

BALDRIDGE, R. C. **Blood ergothioneine and dietary oats.** *Federation Proc.*, 1954, 13, 178. [Dept. Physiol. Chem., Sch. Med., Temple Univ., Philadelphia, Pa.] Experiments with rabbits.

4638

WIESE, H. F., GIBBS, R. H. and HANSEN, A. E. **Essential fatty acids and human nutrition. 1. Serum level for unsaturated fatty acids in healthy children.**

HANSEN, A. E. and WIESE, H. F. 2. **Serum level for unsaturated fatty acids in poorly-nourished infants and children.** *J. Nutrition*, 1954, 52, 355-365; 367-374. [Dept. Paediat., Univ. Texas Med. Branch, Galveston.]

1. A semi-micro spectrophotometric method was used to estimate the serum dienoic, trienoic, tetraenoic and hexaenoic fatty acids in 93 well nourished infants and children.

The values obtained were all of the same order and were dienoic acids 27 to 30, trienoic acids 1-3 to 1-5, tetraenoic acids 9 to 10, and hexaenoic acid 3 to 4 per cent. of the total serum fatty acids. There appeared to be slightly less dienoic and tetraenoic acids in the sera of infants than in children 2 to 15 years old.

2. Levels of dienoic, tetraenoic and hexaenoic fatty acids in the sera of 57 poorly nourished children were significantly lower than in healthy, well nourished children, but the trienoic acid content was significantly higher.—G. A. Garton.

4639

CAGAN, R. N., SOBEL, A. E., NICHOLS, R. A. and LOEWE, L. **Serum lipids in normal and alloxan diabetic rats.** *Metabolism*, 1954, **3**, 168-172. [Dept. Biochem., Jewish Hosp., Brooklyn, N.Y.]

4640

ANDERSON, J. T. and KEYS, A. **Food fats and serum cholesterol.** *Federation Proc.*, 1954, **13**, 449. [Lab. Physiol. Hyg., Univ. Minnesota, Minneapolis.]

4641

MANN, G. V., MUÑOZ, J. A. and SCRIMSHAW, N. S. **Serum lipid levels of Central Americans compared with those of North American adults.** *Federation Proc.*, 1954, **13**, 467. [Dept. Nutrit., Sch. Pub. Health, Harvard Univ., Boston, Mass.]

4642

BARGETON, D., KRUMM-HELLER, C. and TRICAUD, M. E. Influence de d'âge et d'un acétate substitué sur le cholestérol sérique chez le rat. [Effect of age and of a substituted acetate on serum cholesterol in the rat.] *C.R. Soc. Biol.*, 1954, **148**, 63-65.

Two experiments were designed to investigate the variation with age of blood cholesterol in the rat, and the effect upon it of an acetate administered orally.

In the first experiment the level was seen to be dependent on age, as represented by bodyweight, in such a fashion that the points could be split into 2 groups, each giving a significant linear regression upon age and the group means not differing significantly from linearity. In animals between 100 and 250 g. weight, i.e., from 6 to 11.5 weeks old, the level fell with age; in older animals it rose again.

In the second experiment sodium phenylethyl-acetate was administered by mouth daily to 184 rats. Amongst these, blood cholesterol was independent of age and was at a level not significantly different from the lowest value in the untreated rats.

It was concluded that the value of 58 mg. per 100 ml. obtained at 11.5 weeks was an absolute minimum cholesterol level below which the average could not fall either as a result of age or by artificial interference with its metabolism as in the second experiment.—A. W. Boyne.

4643

DURHAM, J. R., COOKE, R. E., LANCASTER, J. W. and MAN, E. B. **Serum butanol-extractable iodine values of children under ten years of age.** *Amer. J. Dis. Child.*, 1954, **87**, 468-474. [Dept. Int. Med., Sch. Med., Yale Univ., New Haven, Conn.]

From a study of 40 normal children aged 2 to 10 years the normal range of serum butanol-extractable I was found to be 4.5 to 7.3 μ g. per 100 ml. Of 56 children suffering from malnutrition, physical or mental retardation, mongolism, obesity, diabetes or hypertension, 41 had values within the normal range. Only undernutrition seemed to play a role in decreasing butanol-extractable I values. None of these children was clinically hyper- or hypothyroid.

Data are briefly quoted to show that values much above the normal range were obtained in 5 hyperthyroid children and very low values in hypothyroid children.—F. C. Aitken.

4644

STOKES, D. K. (Jr.), FUTRELL, M. F. and KUNKEL, H. O. **Further studies on the relationship of serum protein bound iodine levels to rates of gains in beef cattle.** *J. Animal Sci.*, 1953, **12**, 897-898. *Proc.* [Texas Agric. Exp. Stat.]

4645

GAWIENOWSKI, A., MAYER, D. T. and LASLEY, J. F. **An investigation of the protein-bound iodine with its correlation to average daily gain and morphological variations.** *J. Animal Sci.*, 1953, **12**, 946-947. *Proc.* [Univ. Missouri.]

4646

SCATENA, A. R. and MAURELLI, R. Calcemia y medicacion calcica por recto: estudio experimental. [Blood calcium and treatment with calcium by rectum. Experimental study.] *Prensa pediat.*, 1953, **4**, 182-184.

4647

CHESLOCK, K. E. and REYNOLDS, M. S. **Effect of dietary variation on pyridine nucleotide levels in human blood.** *Federation Proc.*, 1954, **13**, 453. [Dept. Foods Nutrit., Sch. Home Econ., Univ. Wisconsin, Madison.]

4648

LINK, R. P. and ST. CLAIR, L. E. **Some metabolic studies on hypophysectomized pigs.** *Endocrinology*, 1954, **54**, 290-295. [Dept. Vet. Physiol., Coll. Vet. Med., Univ. Illinois, Urbana.]

Effect of fasting on composition of the blood.

See also Absts. 4310, 4438, 4503, 4602, 4686, 4741, 4990, 5008, 5093, 5096, 5097, 5099, 5103, 5104, 5172, 5180.

N.A. and R., October 1954

LYMPH, CEREBROSPINAL FLUID, ETC.

4649

- HATTYASY, D. **Unusually high fluorine values in the saliva of subjects free from caries.** *Acta med. hung.*, 1954, **5**, 419-420. [Dept. Stomatol., Med. Sch., Univ. Szeged.]

Saliva which was pooled from 10 gypsies aged between 12 and 19 years, members of a community with a low incidence of caries, was found to contain 74 μg . F per 100 ml. Single samples from 8 persons between 8 and 15 years of age with extensive tooth decay had F contents between 5.4 and 13.1 with a mean of 8.0 μg . per 100 ml. Both groups were consuming water low in F, 20 μg . per 100 ml.

It is suggested that the high concentration may inhibit acid formation by bacteria and block enzyme activity and so limit caries production. The work is being extended.—D. Harvey.

4650

- MONNIER, D. and BESSO, Z. **Étude polarographique de la salive. [Polarographic study of saliva.]** *Helv. chim. Acta*, 1954, **37**, 455-461. [Lab. Mineral Chem., Univ. Geneva.]

4651

- RELLER, H. H., BENEDICT, J. H., MATTSON, F. H. and BECK, L. W. **Composition of lymph lipids in rats fed fat digestion products.** *Federation Proc.*, 1954, **13**, 474-475. [Chem. Div., Procter and Gamble Co., Cincinnati, Ohio.]

4652

- ROBINSON, S. and ROBINSON, A. H. **Chemical composition of sweat.** *Physiol. Rev.*, 1954, **34**, 202-220. [Dept. Physiol., Med. Sch., Indiana Univ., Bloomington.]

TISSUES

4653

- WIJMEGA, H. G., STERN, K. G., O'CONNELL, D. J. and THOMPSON, K. W. **Components of gastric mucosa extracts.** *Federation Proc.*, 1954, **13**, 320. [Organon, Orange, N.J.]

4654

- TALLAN, H. H. **Chromatographic investigation of the free and bound amino acids of animal tissues.** *Federation Proc.*, 1954, **13**, 309. Labs. Rockefeller Inst. Med. Res., New York.]

4655

- GARTON, G. A. **The component fatty acids of bovine mammary-gland fat.** *J. Sci. Food Agric.*, 1954, **5**, 247-251. [Rowett Res. Inst., Bucksburn, Aberdeenshire.]

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Secretory tissue was dissected out of the udders of 2 cows after slaughter. One cow was lactating and one was dry. The fats extracted from the 2 udders were compared and their component fatty acids were prepared.

All the saturated and unsaturated fatty acids of milk fat were found in the non-lactating gland, but it contained more than 40 per cent. palmitic acid and thus differed from the fat of the lactating gland and from milk fat in its major component acids.—D. Duncan.

4656

- LIEBELT, R. A. and EASTLICK, H. L. **The organ-like nature of the subcutaneous fat bodies in the chicken.** *Poultry Sci.*, 1954, **33**, 169-179. [Dept. Zool., State Coll. Washington, Pullman.]

It is concluded that the subcutaneous fat bodies of the chicken arise at a definite time during embryonic life and possess relatively constant size, shape and relation to blood vessels. The term "fat organ" is preferred to "adipose tissue".

D. Duncan.

4657

- MILLER, W. L. (Jr.) and BAUMANN, C. A. **Skin sterols 4. Distribution of Δ^7 -cholestenol.** *Proc. Soc. Exp. Biol. Med.*, 1951, **85**, 561-564. [Dept. Biochem., Coll. Agric., Univ. Wisconsin, Madison.]

4658

- SCHULZE, G. and SÜDHOF, H. **Über den Lipidgehalt des hypertrophierten Säugetierherzens. [The lipid content of the hypertrophied mammalian heart.]** *Pflügers Arch.*, 1953-54, **258**, 211-225. [Physiol. Chem. Inst., Univ. Göttingen.]

A study of guineapigs and dogs.

4659

- SCHULZE, G. **Über den Lipidgehalt und die Lipidverteilung in der Nebenniere des Hundes. [The lipid content and lipid distribution in the adrenal gland of the dog.]** *Pflügers Arch.*, 1953-54, **258**, 226-229. [Physiol. Chem. Inst., Univ. Göttingen.]

4660

- DA COSTA, E., CLAYTON, R. and KRZYWICKI, H. **Effect of free choice during rehabilitation following dietary restriction on fat and water of tissues of rats.** *Federation Proc.*, 1954, **13**, 454. [Army Med. Nutrit. Lab., Fitzsimons Army Hosp., Denver, Colo.]

4661

- HATTYASY, D. and HATOS, G. **Nitrogen content of the human enamel.** *Acta med. hung.*, 1954, **5**,

267-277. [Dept. Stomatol., Med. Sch., Univ. Szeged.] Russian summary.

4662

BARBOUR, E. P. and COOK, S. F. **The effects of low phosphorus diet and hypophysectomy on the structure of compact bone as seen with the electron microscope.** *Anat. Rec.*, 1954, **118**, 215-230. [Dept. Physiol., Sch. Med., Univ. California, Berkeley.] Experiments with rats.

4663

DALLEMAGNE, M. J., FABRY, C. and POSNER, A. S. A propos de l'anhydride carbonique des sels osseux. Note préliminaire. [Carbonic anhydride of bone salts. Preliminary note.] *J. Physiol., Paris*, 1954, **46**, 325-329. [Inst. Therap. Exp., Univ. Liège.]

4664

WASHBURN, R. G., GILMORE, L. O., FECHHEIMER, N. S. and TAYLOR, H. L. **The mineral, nitrogen, and melanin content of cattle hair.** *J. Animal Sci.*, 1953, **12**, 898. *Proc.* [Ohio Agric. Exp. Stat.]

DUCTLESS GLANDS AND HORMONES

4667

MEITES, J. **Influence of hormone levels in the body on nutritional requirements.** *J. Animal Sci.*, 1953, **12**, 924. *Proc.* [Michigan State Coll.]

4668

SIMONNET, H. and LE BARS, H. Les régulations hormonales des métabolismes chez les animaux domestiques. [Hormonal regulation of metabolism in domestic animals.] *Ann. Zootec.*, 1954, **3**, 47-88 (to be continued). [Inst. Nat. Agronom., Paris.]

4669

FAZEKAS, I. G. Experimentelle Angaben zum Farbstoffwechsel und Haarwuchs. Hervor-rufung eines Pigmenthofes um die Brust-warze bei virginalen Kaninchen durch Ver-abreichung von acidotischen Verbindungen. [Experimental results on pigment change and growth of hair. Production of a pigmented areola round the nipple in virgin rabbits by administration of acidotic compounds.] *Virch-ows Arch.*, 1954, **325**, 47-56. [Inst. Gerichtl. Med., Univ. Szeged, Hungary.]

After 16 to 18 months' treatment of virgin rabbits with acidotic compounds, organic or inor-

4665

VAN KOETSVELD, E. E. De invloed van de voeding op het haarkleed en de samenstelling van het haar. [Effect of diet on hair and the com-position of hair.] *Tijdschr. Diergeneesk.*, 1954, **79**, 405-416. English, French and German summaries.

A lecture review.

4666

SIMMONDS, D. H. **The amino acid composition of keratins. 1. The amino acid analysis of merino 64's quality virgin wool.** *Austral. J. Biol. Sci.*, 1954, **7**, 98-110. [Biochem. Unit, Wool Textile Res. Lab., C.S.I.R.O., Mel-bourne.]

The published data on the amino-acid composi-tion of wool are summarised. The technique of Moore and Stein (Abst. 4469, Vol. 21) was used for analysis of a single sample of merino wool and data for 18 amino-acids are tabulated. Two peaks of doubtful identity are the subject of further investigation. The value for glycine is less than that reported by Block (Title 1804, Vol. 9) and the cystine plus methionine S fell short of the total 3.68 per cent. by 0.51 per cent.—D. Harvey.

See also Absts. 4111, 4382, 4907, 5189.

ganic, ammoniacal or non-ammoniacal, pigment was formed in a ring round the nipples. In the neighbourhood of this areola the hair follicles were increased and arranged in 3 to 6 rows, instead of in a single row as in untreated rabbits, and the hair follicles of the lower layers were richer in pigment than those of the upper layers. The increase of hair follicles is ascribed to increased function of the adrenal cortex, but the increased pigmentation to increased melanophore hormone formation by the anterior pituitary. It is sug-gested that the skin pigmentation in pregnancy and in Addison's disease is also to be ascribed to increased melanophore hormone formation. The results are considered important not only from the standpoint of therapy, but also because of their possible practical bearing in the production of fur and wool.—M. B. Richards.

4670

WOOL, I. G., GOLDSTEIN, M. S. and LEVINE, R. **Role of the adrenal medulla in fat mobilization.** *Federation Proc.*, 1954, **13**, 167. [Dept. Physiol., Univ. Chicago, Ill.]

4671

NIMS, L. F. and SUTTON, E. **Adrenal cholesterol, liver glycogen and water consumption of**

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fasting and X-irradiated rats. *Amer. J. Physiol.*, 1954, **177**, 51-54. [Dept. Biol., Brookhaven Nat. Lab., Upton, N.Y.]

4672

GIBERTI, A. and BIANCHINI, P. A.C.T.H. e ormoni cortico-surrenali nella rigenerazione del fegato del ratto. [A.C.T.H. and adrenal cortical hormones in liver regeneration in the rat.] *Riv. Ist. sieroterap. ital.*, 1954, **29**, 87-103. [Ist. Clin. Chirurg. Gen., Univ. Modena.] English summary.

See also Absts. 4448, 4449, 4456-59, 4562.

4673

ENGFELDT, B. and ZETTERSTRÖM, R. **Biophysical and chemical investigation on bone tissue in experimental hyperparathyroidism.** *Endocrinology*, 1954, **54**, 506-515. [Dept. Phys. Cell Res., Karolinska Inst., Stockholm.]

Rats 1, 2, 4 and 8 months old were given by subcutaneous injection 1 U.S.P. unit of parathyroid extract per g. bodyweight for 20 days; 17 hr. after last injection, 0.15 or 0.30 mC. ^{32}P was administered as Na_2HPO_4 . The animals were killed 2 hr. later and the specific activity of bone orthophosphate was measured with an electronic counter.

In the two youngest groups of rats the relative specific activity of bone phosphate was diminished. In 4-month-old rats there was no change, and in 8-month-old rats there was increased activity. The differences in reaction of different age groups to parathyroid hormone should be kept in mind when interpreting experimental results.

After a single dose of parathyroid hormone no effect on renewal rate of bone phosphate could be detected at 6 or 12 hr.; there was a decrease after 18 hr., which persisted at 45 hr. but diminished at 73 hr. and disappeared by 96 hr.

Microradiographs and autoradiographs of cross-sections of bone tissue from young normal and parathyroid-treated dogs were prepared. The bones of the parathyroid-treated dogs showed many large resorption cavities and Haversian systems with low mineralisation, but there was also rebuilding of bone tissue in both groups. The bone destruction in the parathyroid-treated dogs was not different from the normal in type, but only in extent and acceleration.

There is some evidence that the primary effect of the hormone is on the organic or cell constituents of bone.—B. W. Simpson.

4674

TALMAGE, R. V. and KRAINTZ, F. W. **Immediate changes in phosphate excretion following parathyroidectomy in the rat.** *Proc. Soc. Exp. Biol.*

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Med., 1954, **85**, 416-419. [Dept. Biol., Rice Inst., Houston, Tex.]

Rats of 180 to 225 g. were used in these studies; 55 had their parathyroids removed and were given about 7 μC . ^{32}P intraperitoneally, usually 1 hr. after the operation, and water equivalent to 5 per cent. of the bodyweight. They were then placed in metabolism cages and urine was collected hourly or 3-hourly. Experiments ended 3, 7, 11 or 13 hr. after parathyroid removal, when blood was withdrawn for estimation of serum Ca and P.

Parathyroid removal consistently produced an immediate and marked drop in P excretion as shown by excretion of ^{32}P and total inorganic P. Out of 55 rats none failed to show a decrease. By an hour after the operation the effect on the kidney reached its maximum. When parathyroid extract was administered subcutaneously 2 hr. after the operation the rapid fall in P excretion was dramatically reversed.

The reliability of ^{32}P values as an indication of phosphate excretion was tested. A comparison was also made of P excretion rates with serum Ca and P. Although the urinary excretion of P fell within 1 hr. after operation, serum Ca and P changed more gradually; the serum P rise was not significant till the 7th hour. Serum Ca dropped faster than serum P rose. Despite injection of CaCl_2 and Na_2HPO_4 into the parathyroidectomised rats urinary P remained low. It is concluded that in the rat the parathyroids control P and Ca metabolism by a direct action on kidney excretion of P.—B. W. Simpson.

4675

LOTZ, W. E., TALMAGE, R. V. and COMAR, C. L. **Effect of parathyroid extract administration in sheep.** *Proc. Soc. Exp. Biol. Med.*, 1954, **85**, 292-295. [Univ. Tennessee—Atomic Energy Commission Agric. Res. Program, Oak Ridge.]

Subcutaneous injection of parathyroid extract into sheep caused a rise in serum phosphate, the reverse of its effect in dog, rat and man. Urinary excretion of phosphate was only twice normal, small compared with the 30-fold increase produced in rats. Phosphate removal from bone was much increased. The parathyroid extract had no significant effect on Ca metabolism.—T. D. Bell.

4676

CHAKRABORTY, K. P., BOSE, A., BHATTACHARYA, K. L. and DAS GUPTA, N. N. **A study of human thyroid function by means of radioactive iodine.** *J. Endocrinol.*, 1954, **10**, 308-310. [Chittaranjan Cancer Hosp., Calcutta.]

4677

SARETT, H. P. and SNIPPER, L. P. **Stress of thyroid on growth of rats receiving milk diets.**

Federation Proc., 1954, **13**, 476. [Mead Johnson Res. Labs., Evansville, Ind.]

4678

LIPNER, H. J., WAGNER, B. P. and MORRIS, H. P. **Effects of low iodine diet on thyroid: serum radioiodide ratio of mice and rats.** *Federation Proc.*, 1954, **13**, 465. [Nat. Cancer Inst., Nat. Inst. Health, Bethesda, Md.]

4679

TALMAGE, R. V., MONROE, R. A. and COMAR, C. L. **A survey of the effect of phenothiazine on uptake of radioiodine by the thyroids of farm animals.** *J. Animal Sci.*, 1954, **13**, 480-482. [Univ. Tennessee-Atomic Energy Commission Agric. Res. Program, Oak Ridge.]

4680

ERSHOFF, B. H. **Protective effects of liver in immature rats fed toxic doses of thiouracil.** *J. Nutrition*, 1954, **52**, 437-455. [Emory W. Thurston Labs., Los Angeles, Calif.]

Weanling rats received a synthetic diet with vitamin supplement. Thiouracil added at a level of 0.1, 0.25 or 0.5 per cent. retarded growth and caused large increases in thyroid weight. Supplements of the known B vitamins or of alcohol-extracted casein did not influence the effect of thiouracil, but 10 per cent. dried liver produced almost normal growth and resulted in thyroids half the weight of those in rats not given thiouracil. The protective value of different samples of dried liver varied greatly; 3 out of 7 improved growth and only one, a sample with a high iodine content, prevented increase in thyroid weight. Dried kelp as a source of iodine was without effect on the response to thiouracil. Dried thyroid included at 500 mg. per kg. diet had a value similar to that of the most effective liver sample.—D. Duncan.

4681

LERNER, L. J. and LEATHEM, J. H. **Thyroid gland response to thiouracil as influenced by dietary protein.** *Federation Proc.*, 1954, **13**, 86-87. [Bur. Biol. Res., Rutgers Univ., New Brunswick, N.J.]

Experiments with rats.

4682

BUXTON, J., GRUNDY, H. M., WILSON, D. C. and JAMISON, D. G. **The absence of anti-thyroid properties for rats in two types of groundnut oil in common use in Nigeria.** *Brit. J. Nutrition*, 1954, **8**, 170-172. [Lab. Human Nutrit., Univ. Oxford.]

Groundnut oil is a common food in the Northern Territory of Nigeria. There are 2 kinds, an

indigenous oil extracted by hand from the groundnuts by a traditional method, and an unrefined crude oil extracted by machine. These 2 types of oil and a sample of *Oleum arachis* (B.P.) were tested for goitrogenic properties on 24 male rats, 7 to 8 weeks old and weighing 100 to 132 g. The basal diet consisted of sucrose 65, casein 20, groundnut oil 10 and salts 5 per cent. Water-soluble vitamins, vitamins A and D and α -tocopherol were given. The salts provided 2.8 μ g. I per rat daily. Three groups of 8 rats were fed on this diet for 20 weeks, each group being given one of the types of groundnut oil.

There was no difference between the 3 groups in weight of thyroid or in total I content of the glands, and no histological evidence that the oils had any goitrogenic property.—B. W. Simpson.

4683

EARLY, H. and LEBLOND, C. P. **Identification of the effects of thyroxine mediated by the hypophysis.** *Endocrinology*, 1954, **54**, 249-271. [Dept. Anat., McGill Univ., Montreal.]

See also Absts. 4643, 4848, 4960, 5000.

4684

FLUX, D. S., FOLLEY, S. J. and ROWLAND, S. J. **The effect of adrenocorticotrophic hormone on the yield and composition of the milk of the cow.** *J. Endocrinol.*, 1954, **10**, 333-339. [Nat. Inst. Res. Dairying, Univ. Reading.]

Three groups of 5 cows were fed on silage and hay with concentrates, according to milk yield. The ration was constant throughout the 14-day pre-period, 10-day treatment and 14-day post-period. The adrenocorticotrophic hormone (ACTH) used had a strength of 0.78 I.U. per mg. One group of cows received injections of 100 I.U. at intervals of 48 hr. over 10 days; a second received one injection of 200 I.U. at the start of the experimental period and another 10 days later; the cows in the third group received injections of normal saline. Milk yields were recorded at each milking and at suitable times samples from individual cows were taken for analysis. Blood samples were taken before the first injection and again 24 hr. later for eosinophil counts.

Cows receiving 200 I.U. ACTH all showed a significant reduction in eosinophil counts, but the effect of 100 I.U. was variable, the range of fall being 0 to 91 per cent. At both levels single injections of ACTH caused a fall in the milk yield on the first 2 days. There was a significant correlation of +0.84 between the falls in eosinophil counts and in milk yield. Both rapidly returned to almost the original levels after treatment ceased. The treatment had only a slight effect on the composition of the milk. • Butterfat,

non-fatty solids and total protein increased, lactose decreased slightly and Na, K, chloride and N.P.N. showed no change.—W. Godden.

4685

RAUSCHER, H. and SCHNEIDER, W. Zur Verwendung des Fructosetests bei der Ratte unter besonderer Berücksichtigung seiner Eignung für den Nachweis schwacher androgener Effekte. [Use of the fructose test in rats with

special reference to its suitability for demonstrating slight effects of androgens.] *Arch. exp. Pathol. Pharmacol.*, 1954, **221**, 447-459. [I. Frauenklin., Univ. Vienna.]

Fructose is always present in the seminal fluid of adult rats and disappears gradually after castration. Substances thought to have androgenic activity can be tested from the appearance or continued absence of fructose.—I. Leitch.

See also Absts. 5298, 5369.

ENERGY EXCHANGE AND SPECIFIC DYNAMIC ACTION

4686

BROWN, G. M., BIRD, G. S., BOAG, L. M., DELAHAYE, D. J., GREEN, J. E., HATCHER, J. D. and PAGE, J. Blood volume and basal metabolic rate of Eskimos. *Metabolism*, 1954, **3**, 247-254. [Dept. Med., Fac. Med., Queen's Univ., Kingston, Ont.]

Basal metabolic rate was studied in 9 men and 7 women between 16 and 64 years old, and blood volume in 22 men aged 17 to 49 years; all were healthy Eskimos of families living by hunting and trapping.

Both B.M.R. and blood volume were high in July and declined by the end of August, the mean B.M.R. from 131.5 to 123.8 per cent. on DuBois' standard, the blood volume from 4365, S.D. \pm 580, to 3944 \pm 289 ml. per sq.m. body surface.

D. Duncan.

4687

ZUBER, G. Der Grundumsatz bei Zwergwuchs. [Basal metabolism of dwarfs.] *Helv. paediat. Acta*, 1954, **9**, 89-105. [Kinderklin., Univ. Zürich.] French, Italian and English summaries.

Basal metabolism was measured for 93 dwarfed children of ages 3 to 18 years, the term dwarf including all for whom the height age was 30 per cent. or more below the chronological age. The results were compared with those given in 7 different standard tables. In pituitary and hypothyroid dwarfism basal metabolism was uniformly reduced, but in the Turner syndrome, in progeria and in chondrodystrophy it was uniformly increased. These cases were all clinically well characterised. In forms of dwarfism which were poorly characterised clinically, e.g., primordial and dyscerebral dwarfs, dwarfism resulting from chronic internal disease or of unknown etiology, and the Cushing syndrome, there were great individual variations with normal mean values for basal metabolism. The possible causes of the different results in different forms of dwarfism are discussed. A large number of measurements on dwarfs without metabolic disturbances would be required to construct a suitable standard for basal metabolism in dwarfs.—M. B. Richards.

4688

CLARK, L. C. (Jr.) and GARN, S. M. Relationship between ketosteroid excretion and basal oxygen consumption in children. *J. Appl. Physiol.*, 1954, **6**, 546-550. [Fels Res. Inst., Antioch Coll., Yellow Springs, Ohio.]

In boys there was a moderate correlation ($r = +0.6$) between ketosteroid excretion and basal oxygen consumption, but in girls the relation was not significant.—D. Duncan.

4689

VENKATACHALAM, P. S., SRIKANTIA, S. G. and GOPALAN, C. Basal metabolism in nutritional edema. *Metabolism*, 1954, **3**, 138-141. [Nutrit. Res. Labs., Indian Counc. Med. Res., Coonoor.]

An account of the 10 patients with nutritional oedema was given by Gopalan *et al.* (*Indian J. Med. Sci.*, 1952, **6**, 277). Basal metabolism (B.M.R.) was studied immediately on admission to hospital and again after disappearance of the oedema, on the average 31 days later.

B.M.R. on admission ranged from 23.3 to 34.4, mean 27.96 Cal. per sq. m. per hr., and after rehabilitation rose to 30.2 to 38.9, mean 33.4, almost normal for Indian subjects. With this rise of nearly 22 per cent. in B.M.R. the oxygen consumption per kg. cell solids rose by less than 3 per cent. The low B.M.R. during oedema was due to a reduction in the quantity of metabolising tissue.—D. Duncan.

4690

MILLER, A. T. (Jr.). Influence of body fat content on basal metabolism and metabolic cost of work. *Amer. J. Med.*, 1954, **16**, 604-605. *Proc.* [Dept. Physiol., Med. Sch., Univ. N. Carolina, Chapel Hill.]

4691

RAMASWAMY, S. S., MAJUMDAR, N. C. and MOOKERJEE, G. C. Oxygen consumption and optimum rate in muscular work. *Indian J. Physiol. Allied Sci.*, 1954, **8**, 9-17. [Defence Sci. Lab., New Delhi.]



One adult Indian male performed the muscular exercise known as "Baithaks", which consists in repeated knee-bending and stretching from squatting to the erect position. Oxygen consumption was estimated before and during exercise and recovery.

The optimum rate of work was almost identical with that found by Dickinson (*J. Physiol.*, 1929, **67**, 242) for bicycle ergometer work. An empirical formula connecting oxygen requirement and rate of work is given.—D. Duncan.

4692

TAYLOR, H. L., HENSCHER, A., MICKELSEN, O. and KEYS, A. **Some effects of acute starvation with hard work on body weight, body fluids and metabolism.** *J. Appl. Physiol.*, 1954, **6**, 613-623. [Lab. Physiol. Hyg., Univ. Minnesota, Minneapolis.]

Two sets of experiments are compared; the first, series A, was described earlier (Abst. 501, Vol. 15). In series B, 12 healthy young men fasted for 4-5 days with hard work, on 2 occasions about 6 months apart. Their total energy output in 114 hr. was between 15,000 and 16,000 Cal., compared with 9000 to 10,000 Cal. in 66 hr. in series A.

In series B the mean loss of bodyweight was 8 per cent., 65 per cent. of which was lost in the first 48 hr. In the first experiment control weight was regained by the morning of the third day of re-feeding. Plasma volume fell by 18 per cent. and thiocyanate space by 8 per cent. The gain in the first 4 days of re-feeding was mostly due to increase in body fluids; total thiocyanate space increased by 2.4 litres and represented about 40 per cent. of the weight gained. Little or no change in apparent circulating Hb occurred.

Liver function tests suggested malfunction, and one man had jaundice on the fifth day. The results are compared with others collected from the literature, on men who starved without working. Men who worked lost 2 to 2.5 times as much weight in the first day, but only 1.2 to 1.4 times as much on the fourth.—D. Duncan.

4693

HENSCHER, A., TAYLOR, H. L. and KEYS, A. **Performance capacity in acute starvation with hard work.** *J. Appl. Physiol.*, 1954, **6**, 624-633. [Lab. Physiol. Hyg., Univ. Minnesota, Minneapolis.]

In the 2 series of experiments described in the preceding abstract observations were made on pulse rate, oxygen consumption, R.Q., blood sugar, maximum oxygen intake while running, postural adjustment, and maximum performance by a Harvard fitness test.

On the second morning pulse rate during walking had risen from 130 to 145, and it remained between 140 and 151 until the end of the fast. Blood sugar dropped on the second day and subsequently rose slowly. The principal decline in work capacity occurred on the second day, with a smaller loss by the fourth. Maximum oxygen intake decreased by 7.7 per cent. between the first and fifth days, but maximum intake per unit bodyweight remained constant. Blood lactate at rest and after running increased by 198 and 31 per cent., respectively, but pyruvate was unchanged. Fat metabolism accounted for 50 per cent. of the total energy after the first period of work and for 88 per cent. on the second day, and the efficiency of grade walking declined.

The mechanisms of loss of fitness are discussed.
D. Duncan.

4694

BENGTSSON, E. **Working capacity of healthy children, studied with bicycle ergometry.** *Acta paediat.*, 1954, **43**, 215. *Proc.*

4695

FERRES, H. M., FOX, R. H. and LIND, A. R. **Individual variation in energy expenditure.** *J. Physiol.*, 1954, **123**, 74P-75P. [Royal Naval Trop. Res. Unit, Singapore.]

4696

HALE, C. J., SLIEPCEVICH, E. M. and KARPOVICH, P. V. **Energy cost of waste removal.** *Federation Proc.*, 1954, **13**, 65. [Dept. Physiol., Springfield Coll., Springfield, Mass.]

A study of scavengers.

4697

LEGUN, A. F. and MINKH, A. A. **Sutochnyi raskhod energii lyzhnikov v osnovnoi period sportivnoi trenirovki.** [Daily energy expenditure of skiers in the primary period of training.] *Vop. Pitan.*, 1954, **13**, No. 2, 3-9. [Inst. Pitan., Akad. Med. Nauk SSSR, Moscow.]

4698

SULLIVAN, B. J. and MULLEN, J. T. **Effects of environmental temperature on oxygen consumption in arctic and temperate zone-mammals.** *Physiol. Zoöl.*, 1954, **27**, 21-28. [Dept. Biol., Boston Coll.]

The tests were made on 13 ground squirrels, *Citellus barrowensis*, as arctic animal, and on 10 guineapigs and 10 golden hamsters as temperate-zone animals. Oxygen consumption was measured in a constant pressure respirometer with 2 stainless steel chambers. Temperatures in the respirometer were maintained for the guineapigs at 5°, 10°, 15°, 25° and 35° C., for the hamsters at the same except 10°, and for the squirrels at 5°, 10°,

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15°, 20° and 25° C. The squirrels could not survive temperatures below 5° C. unless hibernating, or above 25° C.

For the guinea-pigs and hamsters oxygen consumption showed no significant difference between 25° and 35° C., but increased significantly with fall of temperature below 25° C. The squirrels showed no significant difference at any of the temperatures. The relation to hibernation of the animals' different reactions is discussed; the arctic squirrel cannot enter into hibernation suddenly but requires a nest and conditions preparatory to sleep, from which it passes into hibernation.

E. M. Hume.

4699

MAYER, J. **Exercise (treadmill), food intake and body weight in normal, genetically obese and goldthioglucose obese animals.** *Federation Proc.*, 1954, **13**, 468. [Dept. Nutrit., Harvard Sch. Pub. Health, Boston, Mass.]

Experiments with rats.

4700

ANDIK, I., BANK, J., MÓRING, I. and SZEGVÁRI, Gy. **The effect of exercise on the intake and selection of food in the rat.** *Acta physiol. hung.*, 1954, **5**, 457-461. [Inst. Pathophysiol., Med. Univ., Pécs.] Russian summary.

Ten rats received free choice of 3 diets containing one part of a standard mixture and 2 parts of starch, casein or lard. After consumption was stabilised the rats were given running exercise increasing to 8 or 9 hr. and 6 or 7 km. daily for 40 days.

A high proportion of starch was selected before the exercise period, but 8 or 10 days after exercise began starch consumption declined and more protein and fat were selected. The bulk eaten increased only slightly, but the energy value increased considerably. The choice was reversed when exercise stopped.—D. Duncan.

4701

METTA, V. C. and MITCHELL, H. H. **Determination of the metabolizable energy of organic nutrients for the rat.** *J. Nutrition*, 1954, **52**, 601-611. [Div. Animal Nutrit., Univ. Illinois, Urbana.]

Twelve adult male rats were divided at random into 3 groups of 4 rats each. A 3 × 3 latin square design in all replications was used in the plan of feeding. The 3 experimental diets contained the following, per cent.: casein 43.0, 10.0, 20.0; maize starch 10.0, 73.0, 30.0; lard 38.0, 8.0, 41.0. In addition all diets contained 0.5 per cent. wheat germ oil, 1.5 per cent. cod liver oil, 7.0 per cent. minerals and a vitamin supplement. After a

preliminary 10-day pre-period the rats were transferred to individual glass-bottom metabolism cages to permit separate and accurate collection of urine and faeces. Three 10-day periods were taken, during which each rat received successively each of the experimental diets. The daily energy requirements were calculated from the generalised equation of Brody and Procter (Abst. 2026, Vol. 2), $Q = 70.4 W^{0.734}$ for basal energy, where W is weight in kg.; to this was added 25 per cent. for activity increment. During the third collection period 2 rats became ill and were removed from the experiment. All diets, faeces and urine were analysed for gross energy and total N.

It was considered doubtful whether Rubner's factor of 7.45 Cal. per g. N balance obtained with dogs was applicable to rats. To check this, an extra experiment was made with 7 adult rats offered daily 16 g. of a diet containing 94 per cent. water-extracted lean beef with minerals, vitamins and 2 g. BaSO₄ as roughage. The new factor obtained was 6.29 ± 0.19 Cal. per g. N balance and this was employed in calculating metabolisable energy for each diet for each rat.

A multiple regression equation,

$$ME = cC + sS + fF,$$

was fitted to the 34 sets of data by the method of least squares; C, S and F are g. casein, starch and fat, on the dry basis, consumed per 10 days, ME the metabolisable energy of the diet and c, s and f the metabolisable energy per g. casein, starch and fat, respectively. These latter values as evaluated were 4.673 ± 0.089 Cal. per g. casein, 3.962 ± 0.016 Cal. per g. starch and 8.770 ± 0.065 Cal. per g. fat.—W. Godden

4702

HOHLS, H. W. **Messungen des Respirationsquotienten an ausgewachsenen und wachsenden Hühnern. [Measuring the respiratory quotient of grown and growing poultry.]** *Arch. Geflügelk.*, 1954, **18**, 144-165 [Bundesforsch. Kleintierzucht, Celle.] English summary.

The results of Diakow (Abst. 1176, Vol. 2) with grown fowls are re-analysed to show that R.Q. rose with the amount of feed (barley) digested and that the "thermal energy of feed", i.e., the difference between total oxygen consumed and carbon dioxide liberated in the fed bird and the corresponding values for the bird fasting and at rest, had an R.Q. which was independent of the amount of feed digested and was approximately 1.32.

Experiments with chicks and grown cocks in an open-circuit apparatus gave the following results. In chicks heat production varied over the day in a rhythm; when this had been sufficiently identified, short-period experiments could be corrected to whole-day values. To increase the magnitude

of the readings for oxygen consumption and CO_2 elimination, ventilation was restricted, but so that the percentage of CO_2 in the respired air did not exceed 3. Diakow's results were confirmed with 3 cocks in so far as the R.Q. of thermal energy was little affected by the amount of feed digested, but the R.Q.s were, from the diagram, roughly 0.82, 0.9 and 1.1.

Chicks were normally fed on meal and grain and their rate of weight gain and feed consumption in Cal/W^\dagger are shown in diagrams. The thermal energy of the meal, estimated separately in one experiment, was less than that of grain, so that when both were given, thermal energy varied with the proportion of meal and grain eaten. This experiment, repeated with different allowances of feed, confirmed that the loss of heat was greater with grain, that the R.Q. of the thermal energy of grain rose, with digestible energy of feed, again from a diagram, from 0.70 to about 1.0 and the R.Q. thermal energy of meal from about 0.9 to 1.3.

Further experiments are described with increasing proportion of protein in the meal to show that the thermal energy of feed increases in proportion and from this it is argued that the storage of protein by the growing animal requires expenditure of energy which is supplied by fat when necessary. With increase in feed intake, less fat is burnt, and R.Q. rises.—I. Leitch.

4703

MCDOWELL, R. E., LEE, D. H. K. and FOHRMAN, M. H. The relationship of surface area to heat tolerance in Jerseys and Sindhi-Jersey (F_1) crossbred cows. *J. Animal Sci.*, 1953, 12, 747-756. [U.S. Dept. Agric., Agric. Res. Centre, Beltsville, Md.]

In the course of crossbreeding work the surface area of 20 adult Jersey and 20 adult Sindhi \times Jersey F_1 crossbred cows was measured with a surface integrator, the construction and use of which are described. Neither the ratio of surface to bodyweight (W) nor that to $W^{0.67}$ showed any significant difference between the 2 groups. When dry cows or cows in lactation were submitted to heat tolerance tests for 6 hr. at 105°F . dry bulb and 92°F . wet bulb the rise in rectal temperature of the Jersey cows was almost twice as great as that in the crossbred cows. It would appear that differences in heat tolerance of animals such as the above are not primarily due to differences in proportional surface area, even though the presence of large dewlaps and navel folds might suggest that such a difference in surface area would be found.

The relation between area and bodyweight in the above animals and in animals of adult size reported in the literature can be expressed well enough by a straight line, and it is suggested that, when comparisons are to be made between adult

animals, there is nothing to be gained by the use of $W^{0.67}$.—W. Godden.

4704

MCDOWELL, R. E., MATTHEWS, C. A., LEE, D. H. K. and FOHRMAN, M. H. Repeatability of an experimental heat tolerance test and the influence of season. *J. Animal Sci.*, 1953, 12, 757-764. [U.S. Dept. Agric., Agric. Res. Centre, Beltsville, Md.]

Heifers and cows of a Jersey herd and of a Sindhi \times Jersey F_1 crossbred herd were submitted to heat tolerance tests at 105°F . and 34 mm. Hg vapour pressure from 6 months of age at approximately 2-month intervals except during their first lactation. Statistical examination of the results at first showed poor agreement. When the data were more closely examined the results of rectal temperature response were found to vary greatly with the time of the year. Repeatability coefficients for the rectal temperature response of heifers 8 to 22 months of age were high and satisfactory when the results were sorted into 3 seasonal groups, namely, April to July, response low, August to September and February to March, response high and October to January, response intermediate. The results are explained in terms of two conflicting responses to stress which are differentially affected by the seasonal conditions.

W. Godden.

4705

KIBLER, H. H. and BRODY, S. Environmental physiology with special reference to domestic animals. 19. Relative efficiency of surface evaporative, respiratory evaporative, and non-evaporative cooling in relation to heat production in Jersey, Holstein, Brown Swiss and Brahman cattle, 5° to 105°F . *Missouri Agric. Exp. Stat. Res. Bull.* No. 497, June 1952, pp. 31.

For technical details and earlier work see Absts. 2150, 5049, Vol. 21; 778, Vol. 22.

Data are presented on the effect of temperature changes between 5° and 105°F . on heat and moisture dissipation by evaporative cooling from the outer body surface and respiratory tract in lactating Jersey, Holstein, Brown Swiss and Brahman cows, and in non-lactating Brahman cows and Brown Swiss and Brahman heifers. All breeds attained maximum outer surface evaporative or "sweating" rates of about 150 g. or 87 Cal. per sq.m. per hr. but the rise to maximum levels occurred at lower temperatures in the European than in the Brahman cows. When all rates were computed to outer body surface the European breeds attained maximum respiratory evaporation rates of 50 g. or 29 Cal. per sq.m. per hr. but the Brahman did not exceed 30 g. or 17 Cal. per sq. m. per hr. The percentage of metabolic heat dis-

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sipated by outer surface evaporation varied with temperature but was similar for all breeds. Their 12 per cent. greater surface area per unit weight gave Brahman an advantage over European breeds in outer surface and non-evaporative cooling over the temperature range 60° to 105° F. and a corresponding disadvantage in heat conservation below 40° F.—W. Godden.

4706

THOMPSON, H. J., WORSTELL, D. M. and BRODY, S. **Environmental physiology and shelter engineering with special reference to domestic animals.** 23. The effect of humidity on insensible weight loss, total vaporized moisture, and surface temperature in cattle. *Missouri Agric. Exp. Stat. Res. Bull.* 531, September 1953, pp. 28.

The data were obtained during investigations reported earlier (Absts. 2000, 2498, Vol. 24). Skin or hair temperatures were recorded for 17 body areas in addition to the 6 used in earlier work (Abst. 1840, Vol. 23).

At 12° and 40° F. relative humidity did not affect vaporisation rate, but at 75°, 85° and 95° F. there was a marked depression with increasing R.H. Above 85° F. the effect was greater with Holstein than with Brown Swiss cows. At 95° and 100° F. the effect of increasing R.H. was less with Jerseys than with the larger breeds. Brahman cows appeared to dissipate a greater percentage of their total heat by evaporative cooling at high temperatures and high R.H. than did European cattle.

Great differences were found between surface temperatures at different spots on the body at the lower air temperatures. At 12° F. air temperature, the skin temperature of the Jersey hoof cleft was 30° F., that of the milkwell 85° F. In most cattle at 85° F. and above, a rise in R.H. caused an increase in skin and hair temperature. At 12° and 40° F., R.H. had no effect on skin temperature.

W. Godden.

4707

BADRELDIN, A. L. and GHANY, M. A. **Species and breed differences in the thermal reaction mechanism.** *J. Agric. Sci.*, 1954, **44**, 160-164. [Fac. Agric., Univ. Cairo, Giza.]

The reactions of Egyptian buffaloes and cows and Shorthorn cows to direct solar radiation were compared. Pulse rate, respiration rate and temperature were measured and skin thicknesses were compared.

Buffaloes had the lowest basal body temperature, rate of respiration and pulse, but showed the greatest reaction to solar radiation, indicated by a relatively greater increase in all 3 measurements

than in the cows. The Egyptian cows showed the least reaction. The Shorthorns were most sensitive to ambient temperature in the shade.

Skin thickness of buffaloes was double that of cows, which was the same in both breeds. In all the animals the thickness of the skin increased with age.—T. D. Bell.

4708

CHURCHILL-DAVIDSON, H. C., LYNN, R. B., McMILLAN, I. K. R. and MELROSE, D. G. **A demonstration of the reduction of the body temperature in dogs by surface cooling.** *J. Physiol.*, 1954, **124**, SP. [Dept. Anaesthetics, St. Thomas's Hosp., London.]

4709

FLETCHER, J. L. and REID, G. R. **The effect of shearing on the reaction of lambs to high environmental temperature.** *J. Animal Sci.*, 1953, **12**, 666-669. [Mississippi Agric. Exp. Stat.]

Groups of 3 Southdown-sired lambs were used. One group was shorn, one clipped along the back to a width of 4 in. and one left unshorn. Over 10 test days at environmental temperatures of 90° to 96° F. body temperatures and respiration rates were significantly lower in the shorn group than in either of the other groups, between which differences were small. The results may partly explain reports of higher weight gains by shorn lambs.

J. C. Gill.

4710

LEE, D. H. K. and McDOWELL, R. E. **The meaning of heat tolerance as applied to domestic animals.** *J. Animal Sci.*, 1953, **12**, 949. *Proc.* [Johns Hopkins Univ.]

4711

LEWIS, R. C. and JOHNSON, J. D. **Observations of dairy cow activities in loose-housing.** *J. Dairy Sci.*, 1954, **37**, 269-275. [Dept. Dairy, Michigan State Coll., East Lansing.]

The behaviour of a herd of 20 Brown Swiss cows wintered in a loose-housing barn with an outside yard was observed. Climatic conditions were recorded. The animals had constant access to hay and silage for the first 2 months, after which the silage was withdrawn. When silage was available they spent on the average 5.2 hr. daily eating, 5.1 hr. loitering in the yard, 4.3 hr. loitering in the barn and 8.2 hr. resting. When there was only hay the eating time was not altered, but they spent longer loitering in the barn, less in the yard and longer resting.

Temperatures and respiration rates were significantly lower in these loose-housed cows than in Holstein cows kept in stalls. Pulse rates were higher in the Brown Swiss during the first 9 weeks and lower during the second. The differences were not correlated with differences in environmental temperature.—T. D. Bell.

4712

HART, J. S. and HEROUX, O. (with Foy, G.) **Effect of low temperature and work on blood lactic acid in deer mice.** *Amer. J. Physiol.*, 1954, **176**, 452-454. [Div. Appl. Biol., Nat. Res. Labs., Ottawa, Ont.]

See also Absts. 4176, 5092, 5095, 5115.

CARBOHYDRATES

4713

BERGSTRAND, C. G. and HELLSTRÖM, B. E. **Double glucose tolerance tests in normal and fat children.** *Acta paediat.*, 1954, **43**, 105-106. *Proc.*

4714

RACKER, E. **Alternate pathways of glucose and fructose metabolism.** *Advances in Enzymol.*, 1954, **15**, 141-182. [New Haven, Conn.]

4715

ELLIOTT, W. B. and PHILLIPS, A. H. (Jr.) **Effect of fluoroacetate on glucose metabolism in vivo.** *Arch. Biochem. Biophys.*, 1954, **49**, 389-395. [Dept. Biochem., Sch. Med., Univ. Buffalo, N.Y.]

4716

GOODWIN, R. F. W. **Blood-sugar in foetal and neonatal mammals.** *Nature*, 1954, **173**, 777-778. [Dept. Animal Pathol., Milton Rd., Cambridge.]

In a study of the concentration gradient of glucose across the placenta of the guineapig it was found that the blood sugar concentration was sometimes almost the same in foetal and maternal circulations, but that plasma glucose showed a concentration gradient towards the foetus. The phenomenon was therefore studied in the horse, pig, ox, sheep, goat and rabbit.

In most species examined the foetal and immediately post-natal red blood cells contained a glucose concentration in the water phase similar to the concentration in the plasma, but the glucose within the cells gradually fell to a low level or disappeared. This occurred at different stages in different species; in the foal the change occurred before birth. The cell: plasma distribution may be different for glucose and fructose.

Figures from foetal or neonatal blood sugar estimations cannot legitimately be compared for different species or for different ages of one species without consideration of intracellular glucose concentration.—D. Duncan.

4717

HARTMANN, A. F., MCCOY, E. E., SWARM, P. A. and NAKASATO, D. I. **Further observations on the metabolism of galactose in infants and**

children. *J. Pediat.*, 1954, **44**, 499-507. [Dept. Paediat., Sch. Med., Washington Univ., St. Louis, Mo.]

In normal full-term infants during the first month of life galactose given by mouth or by vein was well tolerated; only small amounts appeared in the blood after the standard test dose of 1.75 g. per kg. bodyweight was given by mouth, and galactose given by either route had disappeared from the blood in 3 hr. Blood glucose levels initially were unstable, as is usual in newborn infants, but within 3 hr. after galactose administration they were stabilised between 49 and 66 mg. per 100 ml. In older infants blood glucose was already stabilised and was not affected by galactose; those infants also tolerated galactose well, as did premature infants without obvious abnormality.

Impairment of galactose metabolism was found in one premature infant which showed high blood galactose and low blood glucose when fed on milk. High blood galactose was found in several infants with different infections or malnutrition and in a 12-year-old girl with cirrhosis of the liver. True idiopathic galactosaemia was seen in one infant, in which blood and spinal fluid galactose levels were almost identical.

It is confirmed that there is no renal threshold for galactose.—D. Duncan.

4718

ALBANESE, A. A., HIGGONS, R. A., ORTO, L., BELMONT, A. and DiLALLO, R. **Effect of age on the utilization of various carbohydrates by man.** *Metabolism*, 1954, **3**, 154-159. [Nutrit. Res. Lab., St. Luke's Hosp., New York.]

Reducing sugar in the blood of 44 subjects was measured at $\frac{1}{2}$, 1, 2 and 3 hr. intervals in tolerance tests with glucose and fructose given by mouth at 1 g. per kg. bodyweight. Ages were from 5 to 89 years and utilisation of lactose was found to change only slightly with advancing years, but that of glucose became less. Comparisons of the rates of utilisation were made by tabulating the mean rise above fasting levels found after an interval of 1 hr. Tests on 7 subjects with sucrose and with invert sugar gave rates between those for glucose and fructose; for 5 subjects with lactose the rate was intermediate between those for sucrose and invert sugar.

It is concluded that for fructose the paths of availability are not affected by age in the same way as are those for glucose; fructose has thus a nutritional advantage additional to its protein-sparing action already reported (see Abst. 2304, Vol. 22).

D. Harvey.

4719

STRUB, I. H., BEST, W. R., CONSOLAZIO, C. F. and GROSSMAN, M. I. **Utilization of intravenously injected fructose and invert sugar in normal human subjects.** *J. Clin. Nutrit.*, 1954, **2**, 32-37. [Med. Nutrit. Lab., Chicago, Ill.] Spanish summary.

Nine normal men aged 27 to 45 years received each of the following infusions for 3 hr. on separate days: 141 g. glucose, 291 g. fructose and 288 g. invert sugar. During all 3 infusions blood glucose reached a peak and then declined. In contrast, blood fructose reached a maximum and then remained fairly steady until the end of fructose or invert sugar infusion. The mean highest total blood sugar was greatest with invert sugar, 243 mg. per cent. compared with 187 and 191 mg. per cent. during glucose and fructose infusions. The mean urinary sugar loss as percentage of sugar infused was 2.12 for glucose, 6.21 for fructose and 4.96 for invert sugar.

Severe pain and cramp occurred in 6 subjects during fructose infusion, milder symptoms in 4 during invert sugar and in one during glucose infusion.—F. C. Aitken.

4720

APPEL, W. and HANSEN, K. J. Über den Anstieg der veresterten Fettsäuren im Blut nach peroraler Zufuhr von Dextrose. [The rise of esterified fatty acids in blood after ingestion of dextrose.] *Ztschr. ges. exp. Med.*, 1953, **122**, 258-263. [Med. Klin., Univ. Kiel.]

The lipid fractions of the blood were estimated in 25 healthy subjects, fasting and 30, 60, 90 and 150 min. after ingestion of 1.5 g. glucose per kg. bodyweight. There was an increase, 30 min. after ingestion of sugar, in the esterified fatty acids of the blood of 1.68 m. equiv. methyl palmitate per litre serum. The increase, which was mainly in the neutral fats, was maintained at 60 min., the original level being regained after 90 min.

It is considered that the results represent not so much fat formation from carbohydrate as a lipolytic metabolic process accompanying glucose assimilation.—M. B. Richards.

4721

RODRÍGUEZ-MIÑÓN, J. L., JIMÉNEZ DÍAZ, C. and DE GÓRGOLAS, R. Alteraciones de la toler-

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ancia hidrocarbonada en enfermos renales.

[Alterations in carbohydrate tolerance in kidney disorders.] *Rev. clín. española*, 1953, **51**, 220-223. [Clín. Méd., Fac. Madrid.] English, German and French summaries.

Blood sugar curves were studied in 14 nephritic patients after a double dose of 50 g. glucose by mouth, according to Exton's method. Ten gave curves of diabetic type. After intravenous injection of glucose the blood sugar values 5 min. after injection were much higher in 5 out of 8 nephritic patients than in normal controls. Possible causes of this are discussed.—M. B. Richards.

4722

SARETT, H. P. and SNIPPER, L. P. (with SCHNEIDER, D. L. and BARNING, C. P.). **Comparison of fructose and glucose in the diet of alloxan-diabetic rats.** *J. Nutrition*, 1954, **52**, 525-540. [Mead Johnson Res. Labs., Evansville.]

Young rats received a synthetic diet containing 64 per cent. dextrinised maize starch for 4 weeks before being injected with alloxan. Some were transferred to similar diets containing 64 per cent. glucose or fructose after 3 weeks and some after 3 months.

Weight gain and blood sugar levels were similar on glucose and on fructose diets. Food intake was slightly less on fructose and water intake considerably less, with correspondingly smaller urine volume and carbohydrate output. Only about 4.7 per cent. of the carbohydrate excreted by rats on fructose diet was fructose. There was a significant relation between blood sugar level and sugar and water excretion; when diabetic rats with the same blood sugar level were compared, those on fructose diet excreted less sugar and less urine than those on glucose.

The livers of diabetic rats on fructose diet were larger than those of diabetic rats on glucose diet or those of normal rats on dextrin diet; the latter groups were not significantly different in this respect. No histological change was found. The kidneys of diabetic rats were larger than those of controls, and contained glycogen deposits in the proximal convoluted tubules and the loops of Henle. The pancreas had fewer and smaller islets of Langerhans and fewer beta cell granules. The carcasses of diabetic rats were relatively small and contained little fat.—D. Duncan.

4723

ADAMS, D. M. and BOLLIGER, A. **Observations on carbohydrate metabolism and alloxan diabetes in a marsupial (*Trichosurus vulpecula*).** *Austral. J. Exp. Biol. Med. Sci.*, 1954, **32**, 101-111. [Gordon Craig Res. Lab., Dept. Surg., Univ. Sydney.]

4724

STURTEVANT, F. M., CALVIN, L. D. and FULLER, N. E. **The relationship among glycosuria, food intake and body weight in alloxan diabetes.** *Metabolism*, 1954, **3**, 262-267. [Div. Biol. Res., G. D. Searle and Co., Chicago, Ill.]

In a preliminary period 39 alloxan-diabetic rats were given food to appetite and glucose excretion and food intake were measured. Thereafter they were grouped and the following approximate amounts of dry food per kg. bodyweight daily were offered: 80 g. to 9, 110 g. to 11 and 130 g. to 10 rats. The 9 remaining animals were fed to appetite and they ate at the rate of 130 g.

Statistical analysis of the data indicated that 84 per cent. of the variability in urinary glucose excretion disappeared when variations in either bodyweight or food intake were allowed for. About 36 per cent. of the food eaten was excreted as glucose and, since available glucose represented 64 per cent. of the diet, slightly more than half was excreted by the kidneys. This degree of diabetes was fairly constant.—D. Harvey.

4725

STETTEN, M. R. and STETTEN, D. (Jr.). **A study of the nature of glycogen regeneration in the intact animal.** *J. Biol. Chem.*, 1954, **207**, 331-340. [Div. Nutrit., Pub. Health Res. Inst. City of New York, Inc.]

Adult rats were maintained on stock pellets or on a synthetic diet. Each rat received a single intraperitoneal injection of 1 mM glucose uniformly labelled with ^{14}C per 100 g. bodyweight and was killed 3 to 48 hr. later. CO_2 and urine

were collected and glycogen was isolated from the tissues and purified.

Maltose obtained by treating liver glycogen with β -amylase accounted in the first few hours for most of the ^{14}C activity, but after 12 hr. there was more in the dextrin residues. In muscle glycogen the specific activity of the maltose fraction continued to exceed that in the dextrin. The glycogen molecule is thus shown not to be homogeneous; glucose residues near the periphery of the molecule are turned over more rapidly than those in more central positions.

In a rat fasted for 24 hr. to remove liver glycogen before injection of labelled glucose and killed 3 hr. after the injection, the liver glycogen was evenly labelled in maltose and dextrin fractions, but muscle glycogen was comparable to that in the fed rats.—D. Duncan.

4726

SAMPSON, J. **Blood sugar and liver glycogen in ketosis of the ruminant.** *J. Amer. Vet. Med. Assoc.*, 1954, **124**, 341-343. [Coll. Vet. Med., Univ. Illinois, Urbana.]

4727

TEPPERMAN, J., TEPPERMAN, H. M. and DEWITT, J. **Comparative study of ketogenesis in rats on high carbohydrate and high fat diets.** *Federation Proc.*, 1954, **13**, 152. [Dept. Pharmacol., State Univ. New York Med. Coll., Syracuse.]

See also Absts. 4366, 4382, 4403, 4404, 4443, 4549, 4553, 4566, 4884, 4912, 4949, 4950.

PROTEINS AND PROTEIN DERIVATIVES

4728

TRISTRAM, G. R. **Advances in protein chemistry.** *Research*, 1954, **7**, 178-189. [Univ. St. Andrews.] •

4729

HEYNS, K. and KÖNIGSDORF, W. **Über Proteine und deren Abbauprodukte. 9. Beitrag zur Bausteinfole—Analyse von Kollagen. [Proteins and their decomposition products. 9. Sequence of constituents—analysis of collagen.]** *Hoppe-Seyler's Ztschr.*, 1953, **295**, 244-263. [Chem. Inst., Univ. Hamburg.]

4730

CRAMPTON, E. W. and RUTHERFORD, E. B. **Apparent digestibility of protein.** *Federation Proc.*, 1954, **13**, 454. [Dept. Nutrit., MacDonald Coll., McGill Univ., Que.]

Experiments on human subjects.

4731

MITCHELL, H. H. and BERT, M. H. **The determination of metabolic fecal nitrogen.** *J. Nutrition*, 1954, **52**, 483-497. [Div. Animal Nutrit., Univ. Illinois, Urbana.]

Seven experiments including 250 N balances on groups of pair-fed rats were made to estimate the biological value of whole egg protein at levels from 0.26 to 20 per cent.

The relation of faecal N to percentage of protein in air-dried diet was linear and the ratio at the lowest protein intake was not statistically different from that estimated from the regression equation of one variable on the other. Despite the results obtained by Bosshardt and Barnes with mice (Abst. 689, Vol. 16), it is concluded that direct estimation of metabolic faecal N is a valid method for studying the value of proteins.

D. Duncan.

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4732

FORSYTH, B. T., SHIPMAN, M. E. and PLOUGH, I. C. (with BOLLIER, M. and HACKELY, B.) **The variability of fecal nitrogen excretion with liquid and solid diets.** *J. Lab. Clin. Med.*, 1954, **43**, 440-444. [Med. Div., Army Med. Serv. Grad. Sch., Washington 12, D.C.]

The relation of daily N intake to daily faecal N was studied in 25 patients, from 106 stool samples over periods of 6 or 7 days, and a regression line was calculated from the data. The success of prediction of faecal N within specified limits was then found for several methods.

The methods of taking daily faecal N as 1.3 g., or as 10 per cent. of the intake, gave only from 27 to 41 per cent. accuracy of prediction within ± 0.25 g. N, and 50 to 76 per cent. accuracy within ± 0.5 g. N. The regression formula of the present series was no better in this respect than standard methods. More accurate results were obtained from an initial stool collection for prediction of future faecal N values, but this method is applicable only when N intake is constant. It is concluded that for accurate N balance calculation it is essential to analyse the stools.—M. B. Richards.

4733

CALLOWAY, D. H. and SPECTOR, H. **Nitrogen metabolism at varying caloric intakes as influenced by fat content of diet.** *Federation Proc.*, 1954, **13**, 453. [Quartermaster Food and Container Inst., Chicago, Ill.]

Experiments with rats.

4734

JOHNSON, R. E., SARGENT, F. II, SARGENT, V. W. and EVANS, R. D. **Interrelations in man among nitrogen balance, caloric intake and protein intake.** *Federation Proc.*, 1954, **13**, 462-463. [Dept. Physiol., Univ. Illinois, Urbana.]

4735

ALBANESE, A. A., BELMONT, A., ORTO, L., DiLALLO, R. and ROSSY, J. **Effect of carbohydrates on the metabolic nitrogen pool.** *Federation Proc.*, 1954, **13**, 173. [Nutrit. Res. Lab., St. Luke's Hosp., New York.]

Experiments on man.

4736

FOX, H. M. and SWANSON, P. **Importance of fat in nitrogen economy of protein-depleted rat when caloric restrictions are imposed.** *Federation Proc.*, 1954, **13**, 457. [Nutrit. Lab., Home Econ. Res. Dept., Iowa State Coll., Ames.]

4737

ARNOLD, A. and SCHAD, J. S. **Nitrogen balance studies with dogs on casein or methionine-**

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supplemented casein. *Federation Proc.*, 1954, **13**, 449. [Sterling-Winthrop Res. Inst., Rensselaer, N.Y.]

4738

FONTENOT, J. P., GALLUP, W. D. and NELSON, A. B. **Influence of added carbohydrate (cerelose) on nitrogen metabolism of steers.** *J. Animal Sci.*, 1953, **12**, 915. *Proc.* [Oklahoma Agric. Exp. Stat.]

4739

BEATON, G. H., RYU, M. H., BEARE, J. L. and McHENRY, E. W. **Protein metabolism in pregnant rat.** *Federation Proc.*, 1954, **13**, 451. [Dept. Pub. Health Nutrit., Univ. Toronto.]

4740

CRISPELL, K. R., PARSON, W. and HARDEN, G. (with BRENT, S.). **The relation of dietary protein consumption to N-15 excretion in normal subjects and in Cushing's syndrome utilizing N-15 glycine orally and intravenously.** *J. Clin. Invest.*, 1954, **33**, 342-346. [Dept. Int. Med., Sch. Med., Univ. Virginia, Charlottesville.]

Three diets were used: normal, high- and low-protein, supplying, respectively, 1 g., 1.6 g. and 0.4 g. protein per kg. bodyweight. Labelled glycine was given at breakfast time when the subjects had been on the diets for a week and were, with a few exceptions, in N equilibrium. Some subjects were given breakfast at breakfast time, for others breakfast was postponed until the evening; the other meals of the day were eaten at the usual times. In healthy subjects given labelled glycine by mouth or by vein the proportion of ^{15}N excreted in the urine in 24 hr. was greater on a high-protein diet and smaller on a low-protein diet than on a normal protein diet. The percentages were somewhat lower when the labelled glycine was given by vein than when given by mouth. The eating of food at the time of glycine administration did not affect the results.

A patient with Cushing's syndrome excreted equally high proportions of ^{15}N on normal- and high-protein diets.

Possible explanations of these results are discussed.—F. C. Aitken.

4741

STANIER, M. W. and HOLMES, E. G. **Malnutrition in African adults. 1. Serum proteins, cholinesterase, and protein-bound lipid.**

2. Protein storage. *Brit. J. Nutrition*, 1954, **8**, 155-164; 173-193. [Dept. Physiol., Makerere Coll., Kampala, Uganda.]

1. The patients were 14 African men suffering from malnutrition with or without liver damage; in hospital they were given a high-protein diet and treated for hookworm with trichloroethylene.

In every patient serum albumin was initially low and globulin high. During recovery the most striking change was the rise in the red cell count; albumin also increased, but not parallel to the red cell count. Globulin sometimes fell, but in 5 patients was almost the same on discharge as initially. The main change in total globulin was in a fraction measured chemically as β -globulin but behaving electrophoretically as γ -globulin; this component was increased in malnutrition.

Serum pseudo-cholinesterase was low initially and rose during treatment, and was significantly correlated with albumin ($r = +0.74$).

Less lipid was carried in the serum lipoproteins than in those of normal subjects.

2. Nitrogen balances were estimated in several of the subjects, maintained on diets high in energy and in protein. N was retained steadily at rates of up to 10 g. daily for many months, but the observed changes in bodyweight were not related to this retention. The reasons for the discrepancy are discussed. N absorption appeared to be poorer than in healthy controls, N loss in the faeces being significantly greater. In 5 subjects cortisone decreased N retention.—D. Duncan.

4742

KELLEY, L. and OHLSON, M. A. **Experimental variables in predicting protein minima for rats.** *J. Nutrition*, 1954, **52**, 325-335. [Dept. Foods Nutrit., Michigan State Coll., East Lansing.]

A series of experiments of cross-over Latin square design was made with rats. The diets used contained none or up to 10 per cent. of dried egg and 4 or 12 per cent. lard. Weight change, energy intake, N intake and N balance were obtained for each rat over 7-day balance periods.

Period effects which may reflect changes in protein stores during the experiments were noted in some. Regression analyses, used to obtain minimum N requirement, showed that the best prediction of weight change was obtainable from N balance, and that it is dependent much more on N than on energy intake, at least under conditions of negative N balance. A comparison between results with rats on low- and high-energy diets suggested that the calories added as fat did not affect the N intake needed for weight maintenance but led to a greater positive N balance. N utilisation was almost as efficient in the area above maintenance as in that below maintenance.

I. McDonald.

4743

PIKE, R. L., SUDER, H. B. and ROSS, M. L. **The influence of protein and energy intakes upon nitrogen retention in the pregnant rat.** *J. Nutrition*, 1954, **52**, 297-309. [Dept. Foods Nutrit., Pennsylvania State Univ., State College.]

Groups of pregnant rats were fed to appetite on 3 rations, low in protein (17 per cent.), in energy or in both. Little difference was noted in maternal weight gain, litter size or foetal weight. Mean N intake and N retention were greatest with the 25 per cent. protein diet, but the highest percentage N retention was with the low-protein, high-energy diet. N retention was in all groups greatest during the third week of pregnancy. On the low-protein, low-energy diet, N retention during the second week of pregnancy appeared to be limited by the energy intake, but during the third week by the protein intake.

It is suggested that N retention, rather than birthweight of the young, be considered the criterion of adequacy of a diet for reproduction in the rat.

C. Warner.

4744

DEBAUN, R. M. and CONNORS, W. M. **Relationship between *in vitro* enzymatic digestibility and *in vivo* protein evaluation of powdered whey.** *J. Agric. Food Chem.*, 1954, **2**, 524-526. [Nat. Dairy Res. Labs., Oakdale, N.Y.]

A positive correlation was found between the amount of lysine liberated by digestion with trypsin and the biological value of the proteins of different dried whey powders. No such correlation was found if the digestion *in vitro* was with pepsin followed by trypsin and chymotrypsin, nor was the N.P.N. concentration or the formol titration of the digest a satisfactory substitute for lysine estimation. Roller-dried whey powders, compared with spray-dried powders, showed little loss of arginine or tryptophan after tryptic digestion, but considerable loss of histidine and lysine; on the other hand, histidine and lysine were relatively stable to storage for 6 months at 40° F., but there was loss of arginine.—C. Warner.

4745

LÓZSA, A. and KOLLER, K. **Estimation of the biological value of rice proteins.** *Acta physiol. hung.*, 1954, **5**, 477-487. [Inst. Pub. Health, Med. Univ., Szeged.] Russian summary.

Dogs were given a protein-free diet for 5 to 6 weeks, until serum albumin had fallen to about 30 per cent. of the total plasma protein. Pairs of dogs then received supplements of 1.5 g. protein per kg. bodyweight daily from casein, whole rice (oryzenin plus globulin plus prolamin), prolamin-free rice (oryzenin plus globulin) or oryzenin.

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With casein as a standard, the relative biological values of the proteins as calculated from the mean time of serum albumin regeneration were whole rice protein 81.4, oryzenin 85.4, globulin 85.4 and prolamin 35 per cent. Hungarian species of rice are considered equal in quality to foreign species.

Dogs on protein-free diets developed fatty livers, but all the proteins were protective.—D. Duncan.

4746

KIK, M. C. **Nutritive value of protein of rice germ.** *Federation Proc.*, 1954, **13**, 463. [Univ. Arkansas, Fayetteville.]

Experiments with rats.

4747

SURE, B. **Biological value of proteins in buckwheat.** *Federation Proc.*, 1954, **13**, 479–480. [Dept. Agric. Chem., Univ. Arkansas, Fayetteville.]

Experiments with rats.

4748

ESH, G. C. and BASU, U. P. **Studies on the nutritive value of enzymatic protein digests. 2. Digestion of casein and groundnut cake with papain and *Aspergillus oryzae*.** *Indian J. Physiol. Allied Sci.*, 1954, **8**, 18–25. [Bengal Immunity Res. Inst., Calcutta 16.]

The growth response when young adult rats received protein hydrolysates after 12 days on a nitrogen-free diet was measured. Casein, whether digested by papain or an *Aspergillus oryzae* preparation, supported good growth. Groundnut cake digested by papain supported moderate growth, which could be improved by adding choline, cystine or methionine; lysine or threonine with methionine gave no extra effect, but the 3 amino-acids together formed a supplement which permitted the groundnut digest to support as good growth as the casein digests. Animals fed on groundnut cake digested by the *Aspergillus* preparation continued to lose weight, which suggested the presence of toxic substances in the digest.

C. Warner.

4749

SCHNEIDER, B. H. and MILLER, D. F. **The biological value of Alaska pea proteins.** *J. Nutrition*, 1954, **52**, 581–590. [Dept. Animal Husb., State Coll. Washington, Pullman.]

Measured with growing rats and at 9 per cent. protein level average biological values for raw and cooked Alaska pea proteins were 60.6 and 61.7 per cent., respectively. Addition of 0.3 per cent. methionine to the peas increased these values to 77.6 and 76.9 per cent. With adult rats and at 6 per cent. protein level average egg replacement values were 78.0 and 72.8 per cent., and with the

same addition of methionine 89.3 and 88.3 per cent., for the pea proteins in raw and cooked forms, respectively.—D. Harvey.

4750

BOSE, S. M. and SUBRAMANIAN, N. **Biological value of the proteins of tamarind and *befri* seeds.** *Bull. Central Food Technol. Res. Inst. Mysore*, 1953, **3**, 66.

Decorticated tamarind (*Tamarindus indicus*) seed contained moisture 12.0, crude protein 16.0, ether extract 6.5, crude fibre 3.8, ash 2.8, carbohydrate (by difference) 58.9 per cent. *Befri* (*Indigofera glandulosa*) seed contained, in the same order as above, 9.3, 31.7, 4.0, 8.1, 3.5, 43.4 per cent.

The gains in weight of rats in g. per g. protein intake were for tamarind seed 1.53 ± 0.092 and for *befri* seed 1.02 ± 0.084 .—P. C. Jowsey.

4751

HODSON, A. Z. **Nutritive value of milk proteins. 2. Stability during sterilization of evaporated milk as determined by the rat growth method.** *Food Res.*, 1954, **19**, 224–230. [Res. Labs., Pet Milk Co., Greenville, Ill.]

The findings of Cook *et al.* (Abst. 2208, Vol. 21) were confirmed, that sterilisation of evaporated milk reduced its value for growth of rats. The loss of value in sterilisation was almost compensated by supplements of methionine, cystine and cysteine.

D. Duncan.

4752

FINK, H., SCHLIE, I. and HEROLD, E. **Über die Eiweissqualität einzelliger Grünalgen und ihre Beziehung zur alimentären Lebernekrose der Ratte. Ein Beitrag zur mikrobiellen Eiweiss- und Fettsynthese. 11. [Protein quality of unicellular green algae and its relation to alimentary liver necrosis in rats. Contribution to synthesis of protein and fat by micro-organisms. 11.]** *Naturwissenschaften*, 1954, **41**, 169. [Int. Gärungswiss., Univ. Cologne.]

Dried material of the unicellular alga *Scenedesmus obliquus* was tested for digestibility and protein quality as measured by the growth of rats. The digestibility *in vivo* was only 60.8 per cent., but the growth curves were as good as those obtained with milk protein, a result not hitherto obtained with any protein of higher fungi, yeasts, moulds or bacteria. In an experiment of 120 days' duration on 20 rats none died, and there was no liver necrosis such as frequently occurred with other fungi or moulds. Apparently the algal material contains adequate amounts of protective substances; tests for their differentiation are not yet completed.—M. B. Richards.

4753

CHALMERS, M. I., CUTHBERTSON, D. P. and SYNGE, R. L. M. **Ruminal ammonia formation in relation to the protein requirement of sheep. 1. Duodenal administration and heat processing as factors influencing fate of casein supplements.**

CHALMERS, M. I. and SYNGE, R. L. M. **2. Comparison of casein and herring-meal supplements.**

ANNISON, E. F., CHALMERS, M. I., MARSHALL, S. B. M. and SYNGE, R. L. M. **3. Ruminal ammonia formation with various diets.** *J. Agric. Sci.*, 1954, **44**, 254-262; 263-269; 270-273. [Rowett Res. Inst., Bucksburn, Aberdeenshire.]

1. A Cheviot ewe maintained during pregnancy on a high plane and another on a low plane of nutrition had their N balances estimated about 6 weeks before lambing on their basal diets, the same supplemented with 50 g. casein, and again on the basal diet. The sheep on the high-plane diet retained 49 per cent. of the supplementary N administered as casein, but the one on the low-plane diet retained only 15 per cent., despite the fact that this animal was in negative N balance.

Similar pregnant ewes 5 or 6 weeks before lambing or non-pregnant ewes, with rumen and duodenal fistulae and all on the low-plane diet, received 50 g. casein by drip into the rumen or duodenum and the effect on their N balance was measured. In all the apparent retention of N of casein supplements was greater with duodenal than with ruminal administration. The extensive conversion of casein to ammonia in the rumen with absorption of NH_3 into the bloodstream was confirmed (*cf.* Abst. 2364, Vol. 22). The course of dissolution in the rumen of casein in the form of tough lumps was followed by the use of stains. A comparison of the N retention of casein given as commercial casein, tough lumps or ground lumps showed the highest value with the ground material; the concentration of ammonia in the rumen liquor was greater with the commercial casein than when the ground material was the supplement. It is concluded that the tendency to value proteins for ruminants in terms of their digestibility is liable to be misleading.

2. When two types of herringmeal and two of casein were given as supplements to Cheviot ewes the concentration of ammonia in the rumen liquor was higher and the retention of supplemental N was less with the latter than with the former.

Growth experiments are reported with Cheviot lambs aged 7 months, on a high-plane basal diet, and with Blackface lambs aged 9 months, on a low-plane diet. The animals were individually caged and fed. Some animals received herringmeal, others casein or maize starch in roughly

isocaloric amounts as supplements. In the high-plane animals there was no significant difference in weight increase between the groups during 91 days or in carcase grading. In the low-plane animals the herringmeals gave much greater liveweight increases and the animals had more bloom. The animals receiving casein or starch put on relatively little weight, although they had greater deposits of fat than the herringmeal animals. None of the meat samples had any taint from the herringmeal. Formaldehyde had been used to preserve one lot of herringmeal, but this did no harm.

3. Cheviot sheep with ruminal fistulae, fed on basal diets of hay or hay and meals, received different supplementary proteins and the concentration of ammonia in the rumen liquor was measured. Ammonia production was great from groundnut meal and slight from maize products. The extent of ammonia production from a given protein concentrate decreased as the amount of starch or cereal meal was increased. Groundnut meal, herringmeal, casein and maize products were the supplements tested.—W. Godden.

4754

FEKETE, L. and KÖRÖPÁČY, I. Beobachtung des Dynamismus der Eiweiss-synthese bei Serum-regenerationsuntersuchungen. [Observation on the dynamics of protein synthesis in serum regeneration experiments.] *Acta physiol. hung.*, 1954, **5**, 469-476. [Inst. Ernährungswiss., Budapest.] Russian summary.

Data are given for synthesis of total serum protein and albumin in regeneration experiments on adult dogs. The animals, previously on full diet, were given a protein-free diet supplying 80 Cal. per kg. bodyweight for 6 weeks, followed by a diet with ample protein as casein, whole milk powder, whole egg or meat for 8 weeks, then the protein-free diet for 6 more weeks and finally the ample diet for 10 weeks. Serum protein fractions were estimated by a nephelometric method in samples taken weekly.

The graph for total protein and albumin values in the different periods show characteristic changes, similar for all 4 foodstuffs tested. Neither in the protein-free nor in the protein-rich period was there a steady change in the values; a succession of peaks and depressions in the curves led gradually to a lower or higher level. Protein withdrawal was seldom followed by an immediate and lasting decrease in serum protein, and ingestion of protein did not lead to an immediate increase.

M. B. Richards.

4755

GROSSMAN, M. I., CALLOWAY, D. H., BOWMAN, J. and CALHOUN, W. K. **Effect of previous level**

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of protein intake on response to injury. *Federation Proc.*, 1954, **13**, 459. [Quartermaster Food and Container Inst., Chicago, Ill.] Experiments with rats.

4756

CRAFTS, R. C. The value of a high protein diet in the prevention of anemia in hypophysectomized adult female rats by means of thyroxine and androgen therapy. *Endocrinology*, 1954, **54**, 542-549. [Dept. Anat., Coll. Med., Univ. Cincinnati, Ohio.]

Hypophysectomized rats which received daily subcutaneous injections of 0.005 mg. thyroxine and 1.0 mg. testosterone propionate showed no anaemia. On the 50th day of treatment the red cell count was 8.83 million per c. mm., the haematocrit 43.2 per cent. and Hb 15.6 g. per 100 ml. Hypophysectomized rats without these injections showed the usual anaemia, the corresponding data for them being 7.23, 35.5 and 12.6; for untreated normal controls the values were 8.63, 44.4 and 15.7, respectively. Treatment with a high-protein diet, 62.5 per cent., in addition to the thyroxine and testosterone propionate induced a rise in the red cell count to 9.68 million per c. mm., in the haematocrit to 47.6 per cent. and in Hb to 17.0 g. per 100 ml.—M. B. Richards.

4757

ROTH, J. S. Incorporation of N¹⁵ into protein and P³² into nucleic acid of the thermally injured rat. *Amer. J. Physiol.*, 1954, **176**, 471-474. [William Goldman Isotope Lab., Hahnemann Med. Coll., Philadelphia, Pa.]

Adult rats with burns of moderate severity excreted on the second and third days 25 per cent. more N than unburned rats. The increase was mostly in urea N; ammonia N excretion fell and faecal N rose only slightly. More ¹⁵N injected as glycine was incorporated in 24 hr. into liver, spleen and intestine and less into kidney by burned rats than by controls. Formation of ammonia from glycine ¹⁵N was 42 per cent. less, and after 72 hr. formation of labelled urea was 121 per cent. greater, though in the first day it was less.

Incorporation of ³²P into liver and intestinal nucleic acids was depressed after 24 hr., but in kidney and spleen it was increased.—D. Duncan.

4758

DEMLING, L. Die Proteinkomponenten der geschädigten Leber. [The protein components of diseased liver.] *Gastroenterologia*, 1954, **81**, 129-152. [Med. Poliklin., Univ. Würzburg.] English and French summaries.

For preliminary accounts see Abst. 61 and Title 2557, Vol. 22.

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Liver homogenates were centrifuged for 30 min. at 1200 g and the cytoplasmic fraction was subjected to paper electrophoresis by the method of Grassmann and Hannig (Abst. 42, Vol. 21; *Arch. exp. Pathol. Pharmacol.*, in the press); the technique is discussed in detail.

The experimental animals, 200 in all, were young adult female rats weighing from 130 to 170 g. Nine were fed for some weeks on a diet of wheat flour, carrots and lard, low in protein and B vitamins. In others the liver was damaged in other ways, namely, by a single injection of carbon tetrachloride, ligation of the bile duct, treatment with hepatotoxic serum, whole-body exposure to X-rays, or inoculation with Walker carcinoma.

Fifty-four human livers were also studied *post mortem*.

Normal rat liver cell protein consisted of albumin 4.8, α -globulin 20.4, β -globulin 44.8 and γ -globulin 30 per cent. In rats on the defective diet α -globulin showed at first a slow steady rise and then a fall, and after about 7 weeks β -globulin fell and γ -globulin rose. Liver damage due to the other procedures was also associated with a fall of β -globulin and a rise of γ -globulin, so that the β : γ ratio was reversed.

β -Globulin was also the most prominent component in the 2 normal human livers studied; albumin was higher than in the rat. The pathological specimens showed the same reversal of the β : γ ratio, whether death was due to liver disease or not.

In the serum of the rats α - and γ -globulin generally behaved in the same way as the liver cell protein fractions, but β -globulin in the reverse way [details not reproduced].

The results are discussed with reference to the role of the liver in protein synthesis.—W. M. Deans.

4759

WACHSTEIN, M. and MEISEL, E. Relation of dietary protein levels to pancreatic damage in the rat. *Proc. Soc. Exp. Biol. Med.*, 1954, **85**, 314-317. [Dept. Pathol., St. Catherine's Hosp., Brooklyn, N.Y.]

Sixty young rats received a protein-free basal diet of percentage composition maize starch 70, vegetable oil 10, cellulose 15, cod liver oil 1 and salt mixture 4, with added vitamins. Other groups of 15 received this diet with supplements of 2, 4 and 7.5 per cent. casein and 1 per cent. *DL*-methionine, respectively. Rats were killed at intervals between the fifth and seventy-fifth days for histological study of the pancreas; those which died were not used.

With the protein-deficient diet there was slow atrophy of acinar cells with loss of zymogen granules, subsequent dissociation of the acini and finally focal proliferation of connective tissue.



The islet tissue was not affected. The 2 per cent. protein supplement did not prevent these changes, but 4 per cent. casein or 1 per cent. methionine gave some protection and with 7.5 per cent. protein the pancreas was almost normal.—D. Duncan.

4760

BLOCK, R. J. and ZWEIG, G. **Studies on bovine whey proteins. 2. Removal of iron from the ferric derivatives of the whey proteins.** *Arch. Biochem. Biophys.*, 1954, **48**, 386-394. [Biochem. Res. Labs., Special Products Div., The Borden Company, Yonkers, N.Y.]

For part 1 see Abst. 2042, Vol. 24.

Three methods were effective in removing Fe from ferrilactin. Reduction with SO_2 gave a denatured mixture of whey proteins readily digestible *in vitro* by pepsin or trypsin but, when compared with heat-coagulated whey proteins, of low nutritive value for growth of young rats unless supplemented with methionine, tryptophan and arginine. Treatment with sodium dithionite gave 2 fractions, one less extensively degraded than the proteins obtained by the first treatment and another resembling β -lactoglobulin in ionic mobility and coagulability by heat. Dialysis against HCl solution, pH 2, gave a mixture mainly of α -lactalbumin and β -lactoglobulin.—D. Harvey.

4761

HARKNESS, R. D., MARKO, A. M., MUIR, H. M. and NEUBERGER, A. **The metabolism of collagen and other proteins of the skin of rabbits.** *Biochem. J.*, 1954, **56**, 558-569. [Nat. Inst. Med. Res., Mill Hill, London, N.W.7.]

The proteins of the skin of growing rabbits were fractionated as follows: a mixture of cellular proteins, plasma proteins and a small amount of a collagenous protein, here named alkali-soluble collagen, soluble in disodium phosphate; acid-soluble collagen insoluble in the phosphate but soluble in a citrate buffer at pH 3.8; an insoluble collagen converted to gelatine by autoclaving; and an insoluble residue. The amounts of hydroxyproline, glycine and tyrosine in the 3 collagen fractions were similar but not identical. Intraperitoneal injection of [^{14}C]-glycine resulted in widely differing radio-activity of similar fractions in different rabbits, though the ratios of radio-activity for different fractions from the same rabbit were fairly regular. Intravenous or oral administration gave much less variable results.

Glycine was isolated from the skin and the plasma proteins from 0.3 to 7 days after labelled glycine was given by mouth, and its radio-activity was measured. The phosphate-soluble protein and the insoluble residue gave activity/time curves similar to those of plasma protein. The curve for insoluble collagen was low and almost flat, that

for acid-soluble collagen showed a slow rise, and that for alkali-soluble collagen showed a marked rise 24 hr. after the dose, then a rapid fall to low values. It is concluded that the alkali-soluble collagen is a true precursor of the other collagen fractions and that the acid-soluble fraction is not a necessary intermediate of all the insoluble collagen of the skin.—C. Warner.

4762

WAHI, P. N. and NIGAM, R. G. **Paper-partition chromatography of amino acids.** *Indian J. Med. Res.*, 1953, **41**, 461-465. [Liver Dis. Res. Unit, Indian Council Med. Res., Agra.]

The R_F values of 34 pure amino-acids were measured by the method of Dent (Abst. 3932, Vol. 18), the solvent being phenol saturated with water.—W. Godden.

4763

ANSELL, G. B. and RICHTER, D. **A note on the free amino acid content of rat brain.** *Biochem. J.*, 1954, **57**, 70-73. [Neuropsychiat. Res. Centre, Whitchurch Hosp., Cardiff.]

4764

AGAR, W. T., HIRD, F. J. R. and SIDHU, G. S. **The uptake of amino acids by the intestine.** *Biochem. biophys. Acta*, 1954, **14**, 80-84. [Dept. Physiol., Univ. Melbourne, Victoria.] French and German summaries.

Segments of isolated rat intestine took up L-histidine from a glucose-bicarbonate buffer solution until the concentration in the wall of the intestine was up to 3 times that in the external solution; equilibrium between segments and surrounding fluid could be reached from either direction. On the other hand, D-histidine was taken up only to a small extent and was not concentrated in the intestine. In the presence of cyanide or dinitrophenol, L-histidine behaved like D-histidine.

It is suggested that amino-acids are transported across the intestinal wall against a concentration gradient by uptake from the lumen as shown in this paper, distribution inside the epithelial cells and then diffusion down a concentration gradient into the bloodstream.—C. Warner.

4765

SHISHOVA, O. A. **Vliyanie fosfornykh soedinenii na vsasyvanie aminokislot. [Influence of phosphorus compounds on amino-acid absorption.]** *Vop. Pitan.*, 1954, **13**, No. 3, 16-18. [Inst. Pitan., Akad. Med. Nauk SSSR, Moscow.]

Male white rats of about 200 g. were used throughout the experiments. Estimations on tissues showed that the inorganic phosphorus content of intestine was high. Amino-acid absorp-

tion was studied in closed loops of small intestine and was most rapid when inorganic phosphate plus adenosinetriphosphate was added to the acid mixture.—D. W. Taylor.

4766

WU, C. **Metabolism of free amino acids in fasted and zein-fed rats.** *J. Biol. Chem.*, 1954, **207**, 775–786. [Sect. Biochem., Mayo Clin., Rochester, Minn.]

When rats were fasted for up to 9 days the total α -amino-N protein and plasma, liver and muscle contained less than in controls fed on casein. The free amino-acids of these tissues were separated by paper chromatography and estimated colorimetrically after elution; alanine, glutamic acid, glutamine, glycine, serine and threonine decreased and taurine, valine and leucine plus isoleucine increased considerably in concentration. Urinary excretion of free amino-acids decreased, but excretion of taurine increased.

When zein was given, the decreases in the concentrations of free amino-acids in the tissues, which again accompanied decrease in protein, were less marked except for decrease of lysine. Urinary excretion of free amino-acids again decreased considerably, though large amounts of bound amino-acids were still excreted.—C. Warner.

4767

ALMQUIST, H. J. **Proportional requirements of amino-acids.** *Arch. Biochem. Biophys.*, 1954, **48**, 482–483. [The Grange Company, Modesto, Calif.]

The author re-examined some of his published work (Abst. 4713, Vol. 17) and concluded that tryptophan, methionine, lysine and arginine were required in the same relative proportions in diets with the same protein content but giving a wide range of growth rates for chickens.—C. Warner.

4768

WILLIAMS, H. H., CURTIN, L. V., ABRAHAM, J., LOOSLI, J. K. and MAYNARD, L. A. **Estimation of growth requirements for amino acids by assay of the carcass.** *J. Biol. Chem.*, 1954, **208**, 277–286. [Dept. Biochem., Cornell Univ., Ithaca, N.Y.]

Rats, chicks and pigs were killed at different stages of growth and 12 or 14 amino-acids were estimated in the carcasses. The patterns of amino-acid composition were similar for all, and so were the estimated amino-acid requirements. Most differences between the 2 sets of figures could be explained as due to the use of amino-acids of the food for purposes other than protein formation, e.g., of methionine as a methyl donor or tryptophan for nicotinic acid formation, or to possible inadequacies of the nutritional experiments. Carcase

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analysis is recommended as a method for estimating the requirement for growth of all or most of the essential amino-acids.—C. Warner.

4769

WOOD, J. L. and COOLEY, S. L. **Substitution of α -keto acids for five amino acids essential for growth of the rat.** *Proc. Soc. Exp. Biol. Med.*, 1954, **85**, 409–411. [Dept. Biochem., Univ. Tennessee, Memphis.]

When young rats were fed on a diet with the 10 essential amino-acids and glutamic acid as N source, growth was slow. When some of the amino-acids were replaced by the corresponding α -ketone bodies, with an equivalent amount of N as glycine, growth ceased, probably because the rats failed to eat. When extra vitamin B₁ and aspartic acid were added and the diet was kept dry, it was eaten and the amino-acids leucine, isoleucine, valine, phenylalanine and methionine could be replaced by their ketone bodies with as good growth as on the basal diet.—C. Warner.

4770

YANG, S. P. and SWANSON, P. **Utilization of nitrogen from amino acid mixtures: relative importance of essential and non-essential amino acids.** *Federation Proc.*, 1954, **13**, 483–484. [Nutrit. Lab., Home Econ. Res. Dept., Iowa State Coll., Ames.]

Experiments with rats.

4771

ASENJO, C. F. and GOYCO, J. A. **Effect of supplementing polished rice and red kidney beans diet with amino acids.** *Federation Proc.*, 1954, **13**, 450. [Dept. Biochem. Nutrit., Sch. Med., Univ. Puerto Rico, San Juan.]

Experiments with rats.

4772

Lo BIANCO, S. **L'aminoaciduria nel bambino del primo anno di vita. [Amino-aciduria of infants in the first year of life.]** *Lattante*, 1953, **24**, 781–795. [Ist. Clin. Pediat., Univ. Parma.]

Amino-acids were identified by paper chromatography in the urine of 48 infants. The results are tabulated for premature and full-term infants of ages up to one year, fed artificially and at the breast. All the babies excreted some amino-acids, but the amounts were greater in artificially fed than in breast-fed babies. In premature infants retention of N was greater, and excretion of amino-acids less, than in full-term babies.

E. M. Hume.

4773

DRABLØS, A. **Aminosyrer og aminoaciduri. [Amino-acids and loss of amino-acids in**

urine.] *Nord. Med.*, 1954, **51**, 699-703.
[Bergen.] English summary.
A review.

4774

BEARN, A. G. and KUNKEL, H. G. **Abnormalities of copper metabolism in Wilson's disease and their relationship to the aminoaciduria.**

STEIN, W. H., BEARN, A. G. and MOORE, S. **The amino acid content of the blood and urine in Wilson's disease.** *J. Clin. Invest.*, 1954, **33**, 400-409; 410-419. [Labs., Rockefeller Inst. Med. Res., New York.]

Serum and urinary Cu, serum Cu enzyme or ceruloplasmin and α -amino-N in urine were estimated in 17 patients with Wilson's disease, 23 with cirrhosis of the liver and 12 normal subjects. Low values of Cu in serum were found in all except one patient with Wilson's disease; in liver cirrhosis values were normal or above. All patients with Wilson's disease had low ceruloplasmin and high urinary Cu; high ceruloplasmin and slightly increased urinary Cu values were found in liver cirrhosis. Amino-acids occurred in urine in 16 of the 17 patients with Wilson's disease, not at all in 35 unaffected siblings and not in any of the patients with liver cirrhosis. In Wilson's disease increase in amino-acid excretion due to increased protein intake or to cortisone administration was accompanied by a parallel increase in urinary Cu excretion.

Amino-acid distribution in 24-hr. specimens of urine was investigated by chromatography in 6 patients with Wilson's disease. Increases above normal were greatest for threonine and cystine, followed by serine, glycine, asparagine, valine, tyrosine and lysine, followed by histidine, ornithine and phenylalanine. Conjugated amino-acids were excreted in amounts greater than normal. A study of the plasma in 2 patients showed almost normal amino-acid distribution. The amino-acid composition of fasting samples of urine was studied in 2 normal subjects and 2 with Wilson's disease; only in patients with Wilson's disease was the distribution different from that of 24-hr. specimens. Giving a protein meal to a normal subject and one with Wilson's disease resulted in approximately similar rises in plasma amino-acid levels. There was no appreciable change in urinary amino-acids in the normal subject and large increases in most urinary amino-acids in the patient with Wilson's disease.

It is concluded that the loss of amino-acids in urine in Wilson's disease is the result of a renal lesion.—F. C. Aitken.

4775

ULRICH, J. A. (with SCHROPP, M. and MARTIN, E. J.) **Urinary excretion of amino acids by**

human subjects on unrestricted diets. *Proc. Staff Meetings Mayo Clin.*, 1954, **29**, 210-214. [Sect. Biochem.]

Free and total amino-acids were estimated in 24-hr. samples of urine from 14 women aged 20 to 40 and 12 men aged 20 to 60 years, eating their usual diets. Values are tabulated for 14 amino-acids.

Men excreted more arginine, aspartic acid, histidine, leucine, methionine, phenylalanine, threonine, tryptophan and tyrosine, but less proline, than women. One man had a significantly high output of lysine, the only significant departure from the mean levels of excretion.—D. Duncan.

4776

LANGNER, R. R. and BERG, C. P. **Urinary excretion of tryptophan and tryptophan metabolites following ingestion of D- and DL-tryptophan by the normal human subject.** *Federation Proc.*, 1954, **13**, 247. [Dept. Biochem., State Univ. Iowa, Iowa City.]

4777

COLE, A. S. and SCOTT, P. P. **Tissue changes in the adult tryptophan-deficient rat.** *Brit. J. Nutrition*, 1954, **8**, 125-138. [Dept. Physiol., Univ. Bristol.]

Adult rats were rendered tryptophan-deficient by feeding them on an acid-hydrolysed casein diet for more than 100 days, and were compared with normal and pair-fed controls on an unhydrolysed casein diet and others fed on the hydrolysed casein supplemented with 0.2 or 0.01 per cent. tryptophan.

The deficient rats showed emaciation, anorexia, staring coats, hypochromic anaemia, permanent dioestrus, staining of the wrists, paws and nose with reddish material presumed to be a porphyrin, and nervous signs including lethargy, atonia and hyperexcitability. The liver showed chemical, histological and cytological evidence of loss of substance, notably ribonucleoprotein; mitochondria and other cytoplasmic granules were reduced in number and distorted. Chemical and histological examination for fat and glycogen gave fairly normal results, compared with low figures for the pair-fed controls. Epithelial and secretory tissues showed a reduction of cytoplasm, voluntary muscle fibres were reduced in diameter, and testes showed degenerative changes. Most of these effects appeared to be specifically due to the deficiency of tryptophan. Inclusion of a small, inadequate amount of tryptophan in the diet did not exert a protective effect on any individual tissue.—C. Warner.

4778

MACHLIN, L. J. **Methionine metabolism in the laying hen. 1. Effect of change in the dietary**

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protein or tryptophan level on deposition of S^{35} in the egg. *Poultry Sci.*, 1954, **33**, 201-205. [Bur. Animal Indust., U.S. Dept. Agric., Beltsville, Md.]

Four hens fed on a ration containing 19 per cent. protein and made of soya bean meal 24, fishmeal 5, alfalfa meal 5, bonemeal 3, minerals 3, butyl fermentation solubles 0.5, vitamins A and D oil and yellow maize meal to 100, were given an injection of 0.8 mg. DL-methionine labelled with ^{35}S . In the next 10 days 27 per cent. of the ^{35}S was recovered in the excreta and 31 per cent. in the eggs. The yolks contained about twice as much as the whites. Maximum ^{35}S activity was found in the whites laid 3 days and the yolks laid 6 days after injection.

After 11 days 2 hens were transferred to a ration containing 9 per cent. crude protein; for the next 2 weeks the eggs from these birds had higher ^{35}S contents than eggs from the birds given the high-protein diet. This is evidence that the amino-acid intake was inadequate for egg production, and that tissue reserves had been called on; and it is suggested that the technique might be used to study the amino-acid requirements of the laying hen.

Similar results were obtained with rations containing different levels of tryptophan.

K. J. Carpenter.

4779

SHERWOOD, F. W., WELDON, V. and PETERSON, W. J. Effect of cooking and of methionine supplementation on the growth-promoting property of cowpea (*Vigna sinensis*) protein. *J. Nutrition*, 1954, **52**, 199-208. [Nutrit. Sect., Dept. Animal Husb., N. Carolina Agric. Exp. Stat., Raleigh.]

Nine samples of cowpeas grown in 1947 were compared. Part of the sample was ground and used raw and part was soaked overnight, cooked and dried before being ground. The peas provided 12 per cent. crude protein in a diet containing hydrogenated vegetable fat 9, cod liver oil 1, $CaCO_3$ 1, NaCl 0.5 and starch to 100 parts, with a vitamin supplement. Besides these 18 diets, 6 containing raw cowpeas were supplemented with 0.3 per cent. methionine. The diets were given to appetite for 21 days to rats in a 5×5 balanced lattice experiment.

The differences in growth between rats on the unsupplemented raw cowpea diets were not significant. Cooking significantly improved the value of some samples but not of others. The methionine supplement gave significantly better growth than either raw or cooked cowpeas without methionine. Lack of available methionine is considered to limit the growth of young rats given cowpeas as the sole source of protein.—D. Duncan.

4780

EDWARDS, L. J. Utilization of topically applied methionine by the guinea pig. *Nature*, 1954, **173**, 1042-1043. [Beecham Research Laboratories, Ltd., Brockham Park, Betchworth, Surrey.]

A solution of methionine- ^{35}S was injected intramuscularly, given by mouth or applied locally to shaved skin, and hair from treated guineapigs was clipped at intervals for estimation of its radioactivity.

After intramuscular injection 3 to 5 per cent. of the dose appeared in the hair, the peak of activity occurring after 2 weeks and some activity still remaining after 2 months. About 2 per cent. of the dose given by mouth and 1 per cent. of that applied locally appeared in the hair. Most of the activity of the hair was in the cystine fraction.

C. Warner.

4781

PATWARDHAN, M. V. Metabolism of methionine in the intact rat. *Federation Proc.*, 1954, **13**, 272. [Dept. Biochem., Med. Sch., W. Reserve Univ., Cleveland, Ohio.]

4782

PAYNE, Z. and EDWARDS, C. H. Symptoms of methionine deficiency in adult rats. *Federation Proc.*, 1954, **13**, 525. [Sch. Home Econ., Tuskegee Inst., Ala.]

4783

BARON, H. and ALLISON, J. B. Effect of methionine and glycocyamine on growth of rats. *Federation Proc.*, 1954, **13**, 450. [Bur. Biol. Res., Rutgers Univ., New Brunswick, N.J.]

4784

HSU, B., ANDERSON, E. I., WEISS, S. and STEKOL, J. A. Neosynthesis of methionine, choline and serine in the chick. *Federation Proc.*, 1954, **13**, 461-462. [Lankenau Hosp. Res. Inst., Philadelphia, Pa.]

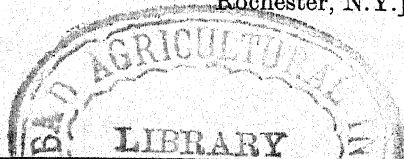
4785

GORDON, R. S. and SIZER, I. W. Nutritional equivalence of methionine hydroxy analogue (MHA) and methionine for growth. *Federation Proc.*, 1954, **13**, 58-59. [Res. Dept., Monsanto Chemical Co., Everett, Mass.]

Experiments with chickens.

4786

MILLER, L. L. and BALE, W. F. The metabolic conversion of the carbon chain of lysine- $6-C^{14}$ to glutamic acid, aspartic acid and arginine. *Arch. Biochem. Biophys.*, 1954, **48**, 361-369. [Dept. Radiation Biol., Sch. Med., Univ. Rochester, N.Y.]



When dogs received DL-lysine-6-¹⁴C by mouth, radio-activity was found in the lysine, glutamic acid, aspartic acid and arginine of plasma and liver. About three-quarters of the activity of the glutamic acid came from the γ -carboxyl C atom, the remainder from the α -carboxyl atom. It is suggested that lysine may be converted to glutamic acid in part directly via ketoglutarate, and in part indirectly via acetate.

The activity of arginine was evenly distributed between the ornithine and guanidine moieties, none coming from the carboxyl group. It was thought more likely that arginine and glutamic acid had a common precursor, such as ketoglutarate, than that arginine was formed from glutamic acid.—C. Warner.

4787

ROSENBERG, H. R., ROHDENBURG, E. L. and BALDINI, J. T. **The fortification of bread with lysine. 3. Supplementation with essential amino acids.** *Arch. Biochem. Biophys.*, 1954, **49**, 263-267. [Stine Lab., Grasselli Chem. Dept., E.I. du Pont de Nemours and Co., Inc., Newark, Del.]

For earlier work see Abst. 185, Vol. 22 and 607, Vol. 23. The technique and basal diets were as described in the second paper.

No benefit resulted from supplementing the basal bread diets containing 0.2 or 0.4 per cent. added lysine with 0.1 per cent. DL-methionine, or 0.2 or 0.4 per cent. L-valine, or 0.1 per cent. L-threonine, or all these amino-acids together. It is concluded that for growth of rats the only amino-acid deficient in commercial white bread is lysine.—D. Duncan.

4788

ROTHSTEIN, M. and MILLER, L. L. **Loss of the α amino group in lysine metabolism to form pipercolic acid.** *J. Amer. Chem. Soc.*, 1954, **76**, 1459. [Dept. Radiation Biol., Sch. Med. Dent., Univ. Rochester, N.Y.]

With the technique described earlier (Abst. 737, Vol. 24) it was shown that when DL-lysine- ϵ -¹⁵N HCl was injected intraperitoneally into a fasted rat pure pipercolic acid containing ¹⁵N could be isolated from the urine. This supports the view expressed previously that the formation of pipercolic acid is a major and primary step in lysine metabolism.—W. Godden.

4789

BEESON, W. M., MERTZ, E. T. and HENSON, J. N. **Amino acid requirements of swine—phenylalanine.** *J. Animal Sci.*, 1953, **12**, 906-907. *Proc.* [Purdue Univ.]

4790

EGGERT, R. G., WILLIAMS, H. H., SHEFFY, B. E., SPRAGUE, E. G., LOOSLI, J. K. and MAYNARD, L. A. **The quantitative leucine requirement of the suckling pig.** *J. Animal Sci.*, 1953, **12**, 914. *Proc.* [Cornell Univ.]

4791

COXON, V. and KOLB, F. O. **The use of oral choline in cystinuria.** *Metabolism*, 1954, **3**, 255-261. [Dept. Med., Harvard Med. Sch., Boston, Mass.]

Urinary cystine was estimated by conversion to cysteine and use of the nitroprusside reaction, the procedure described being based on that of Krishnaswamy (Title 16, Vol. 12).

Administration of 3 or 8 g. choline chloride daily to 3 cystinuric subjects, of whom 2 were also receiving sodium citrate, did not affect excretion of cystine in the urine. This suggests that the conversion of methionine to cystine in the cystinuric subject is not influenced by the availability of labile methyl groups.

In conclusion, theories of the etiology of the condition are discussed.—W. M. Deans.

4792

KULWICH, R., STRUGLIA, L., JACKSON, J. T. and PEARSON, P. B. **Synthesis of cystine and methionine from ³⁵S-labeled sodium sulfate in the rabbit.** *Federation Proc.*, 1954, **13**, 463. [Bur. Animal Indust., U.S. Dept. Agric., Beltsville, Md.]

4793

GIANETTO, R. and BOUTHILLIER, L. P. **The metabolism of DL-hydroxyproline-2-C¹⁴ in the rat.** *Canad. J. Biochem. Physiol.*, 1954, **32**, 154-160. [Dept. Biochem., Univ. Montreal, Que.]

Synthesis of DL-hydroxyproline-2-¹⁴C is described. Doses of 65 and 100 mg. were given by intraperitoneal injection to one and two rats, respectively. The rats were fasted for 15 hr. before the injection and CO₂ and urine were collected for 4 hr. afterwards; the rats were then killed and the carcasses analysed.

¹⁴C excretion in respired CO₂ was about 12 per cent. of that injected, and in urine 20, 25 and 28 per cent. In rats 2 and 3, 65 and 63 per cent. of the ¹⁴C in the urine was in excreted DL-hydroxyproline. Of the amino-acids isolated from tissue proteins glutamic acid had the highest specific activity, then aspartic acid and hydroxyproline, but proline had very little activity.

A pathway is suggested for the conversion of DL-hydroxyproline to glutamic and aspartic acids. D. Duncan.

4794

NASSET, E. S. and GATEWOOD, V. H. **Nitrogen balance and hemoglobin of adult rats as affected by amino acid diets low in histidine.** *Federation Proc.*, 1954, **13**, 470. [Dept. Physiol., Sch. Med. Dent., Univ. Rochester, N.Y.]

4795

PHILLIPS, H. J. **Activity of rats on free, normal and excess glutamic acid diets.** *Federation Proc.*, 1954, **13**, 112. [Dept. Physiol. Pharmacol., Med. Sch., Creighton Univ., Omaha, Nebr.]

4796

STETTEN, D. (Jr.) **Recent contributions to the understanding of the metabolic defect in gout.**

Geriatrics, 1954, **9**, 163-171. [Div. Nutrit. Physiol., Pub. Health Res. Inst. City of New York, Inc.]

Studies of uric acid metabolism with ^{15}N have shown that in gout the miscible pool of uric acid is greatly increased. In some gouty subjects dietary glycine appears to enter the purine nucleus of uric acid more promptly than in normal man.

F. C. Aitken.

4797

REPP, W. W., HALE, W. H. and CHENG, E. W. **Blood urea and ammonia levels in lambs following oral administration of graded amounts of five experimental non-protein nitrogen feeding compounds.** *J. Animal Sci.*, 1953, **12**, 953. *Proc.* [Iowa State Coll.]

See also Absts. 4174, 4327, 4404, 4420, 4437, 4516, 4523, 4581-82, 4853, 4923, 4989, 4994, 5270, 5455.

FATS AND OTHER LIPIDS

4798

HECKER, R. and ANDREWS, W. H. H. **Fat utilization in adults on a diet of cow's milk.** *Brit. Med. J.*, 1954, **i**, 1131-1132. [Sch. Trop. Med., Liverpool.]

In 2 men on a diet of milk for 1 month, fat excretion and absorption were studied for 3 days during the last week. The percentage of fat intake absorbed was 94; of the fat excreted 72 and 74.5 per cent. was excreted as soap.

F. C. Aitken.

4799

HARRIS, R. S., CHAMBERLAIN, J. W. and BENEDICT, J. H. **Formation of monoglycerides during fat digestion in human beings.** *Federation Proc.*, 1954, **13**, 525-526. [Dept. Food Technol., Massachusetts Inst. Technol., Cambridge.]

4800

BLOOM, B., KIYASU, J. Y., REINHARDT, W. O. and CHAIKOFF, I. L. **Absorption of phospholipides. Manner of transport from intestinal lumen to lacteals.** *Amer. J. Physiol.*, 1954, **177**, 84-86. [Dept. Physiol., Sch. Med., Univ. California, Berkeley.]

Phospholipins containing ^{14}C -labelled fatty acids were prepared by feeding rats on radio-active palmitic acid dissolved in maize oil; 9 hr. later the animals were killed and the phospholipins were prepared from the homogenised liver by extraction with ethanol and ether and precipitation with acetone. Tripalmitin- ^{14}C or phospholipins dissolved in maize oil were then given by stomach tube to rats with cannulae in their intestinal lacteals. Lymph was collected for 11 to 23 hr. and the lymph lipids were analysed for total fatty acid- ^{14}C and phospholipin-fatty-acid- ^{14}C . After

lymph collection the rats were killed and their gastro-intestinal contents were added to faeces voided during the experiment, and the whole was analysed for fatty acid- ^{14}C . From the difference between the amount of ^{14}C administered and that recovered from the gut and faeces the amount of ^{14}C absorbed was calculated.

When labelled tripalmitin was administered about 3 per cent. of the lymph fatty acid- ^{14}C was present as phospholipins; the corresponding figure when ^{14}C -labelled phospholipins were given was about 20 per cent., showing that a significant amount of ingested phospholipin was absorbed before intestinal hydrolysis had taken place.

G. A. Garton.

4801

JEFFRIES, G. H. **The effect of fat absorption on the interaction of chyle and plasma in the rat.** *Quart. J. Exp. Physiol.*, 1954, **39**, 77-81. [Sir William Dunn Sch. Pathol., Oxford.]

Blood plasma from rats on stock diet containing 2 per cent. fat occasionally clarified added milky chyle *in vitro*, as described by French *et al.* (*Quart. J. Exp. Physiol.*, 1953, **38**, 101). In rats on a fat-free diet this clearing power was absent. During absorption of olive oil, clearing activity rose to a peak at 3 and 6 hr. and had disappeared 12 hr. after the meal. Incubation of plasma for 2 hr. at 37°C . destroyed the clearing activity.—D. Duncan.

4802

BORGSTRÖM, B. **The formation of new glyceride-ester bonds during digestion of glycerides in the lumen of the small intestine of the rat.** *Arch. Biochem. Biophys.*, 1954, **49**, 268-275. [Dept. Physiol. Chem., Univ. Lund, Sweden.]

Groups of fasting rats received one of the following fat preparations, 1 ml. per rat, by

stomach tube: olive oil containing 0.17 per cent. free ^{14}C -labelled palmitic acid; a mixture containing 1-mono-olein 54.6, oleic acid 45.2 and labelled palmitic acid 0.2 per cent.; olive oil containing 9.2 per cent. free ^{14}C -labelled decanoic acid; maize oil containing 5.0 per cent. ^{14}C -labelled butyric acid; 1-mono-olein. Between 1 and 3 hr. later the animals were killed and the lipids in the lumen of the small intestine were extracted and analysed for free fatty acids, mono-, di- and triglycerides; the radio-activity of each fraction was measured.

Radio-active mono-, di- and triglycerides were isolated from the intestines of the animals given olive oil plus palmitic acid and of those given monoglyceride plus palmitic acid, showing that the incorporation of free fatty acid into intestinal glyceride combination is due, at least partly, to new ester-bond formation and is not entirely due to inter-esterification. Decanoic acid was absorbed from the intestine more rapidly than palmitic acid. Butyric acid was absorbed even more rapidly than decanoic acid and none was detected in glyceride combination in the intestinal lumen. A significant fraction of mono-olein underwent intestinal hydrolysis. Fatty acids produced by hydrolysis of glycerides were absorbed more rapidly than intact glycerides.—G. A. Garton.

4803

MATTSON, F. H., BENEDICT, J. H. and BECK, L. W.
Composition of intestinal lumen lipides following the feeding of triglycerides, partial glycerides or free fatty acids. *J. Nutrition*, 1954, **52**, 575-580. [Chem. Div., The Procter and Gamble Co., Cincinnati, Ohio.]

Groups of 3 rats were fasted for 48 hr. and then given, by stomach tube, tricaprln or cottonseed oil alone or with different amounts of 2-monoglyceride, 1-monoglyceride or cottonseed oil fatty acids. After 3 hr. the rats were killed and their intestinal contents were analysed for 1-monoglycerides, 2-monoglycerides and free fatty acids.

No matter whether cottonseed oil (containing mainly C_{18} acids) or tricaprln (C_{10} acid) was given, the quantity and isomeric forms of monoglycerides formed were similar. When as much as 21 per cent. of the ingested fat consisted of 1-monoglyceride or 30 per cent. of diglyceride the composition of the intestinal lipids was little affected. When free fatty acids were given with cottonseed oil no 2-monoglycerides were found in the intestinal digestion mixture. When the acids formed 5 or 15 per cent. of the ingested mixture no increase in free acid was noted, but when the acids formed 27 and 50 per cent. of the mixture larger amounts of free acids were found in the intestinal lumen.

G. A. Garton.

4804

HARRIS, R. S. and SHERMAN, H. **Comparison of the nutritive values of mono-, di-, and triglycerides by a modified pair-feeding technique.** *Food Res.*, 1954, **19**, 257-262. [Dept. Food Technol., Massachusetts Inst. Technol., Cambridge, Mass.]

Groups of weanling rats were given mono-, di- and triglycerides and a mixture of the 3 fats as 15 and 25 per cent. of a synthetic diet or as 15 per cent. of a diet of natural foodstuffs. The animals were pair-fed for 70 days; the food intake of the test groups was slightly restricted and the control groups were fed on the same level. The triglycerides consisted of a mixture of partly hydrogenated soya bean and cottonseed oils; the mono- and diglycerides were prepared from the mixture.

No significant difference was observed in body-weight gain or in gain per Cal. consumed between any of the groups, and the fats appeared to be nutritionally equivalent.—G. A. Garton.

4805

MENG, H. C. **Utilization of a "synthetic" triglyceride preparation by weanling rats.** *Amer. J. Med.*, 1954, **16**, 599-600. [Dept. Physiol., Sch. Med., Vanderbilt Univ., Nashville, Tenn.]

4806

BURR, W. W. (Jr.), DUNKELBERG, C. and TIDWELL, H. C. **Chylomicrons and absorption of labeled fatty acid.** *Federation Proc.*, 1954, **13**, 187-188. [Dept. Biochem., Southwestern Med. Sch., Dallas, Tex.]

4807

NARAYANA RAO, M. **Nutritive value of buffalo-butter fat.** *Indian J. Med. Res.*, 1954, **42**, 29-36. [Lab. Food Technol., Indian Inst. Sci., Bangalore 3.]

Buffalo butterfat was fractionated from acetone at 28° C. (fraction 1), at 0° C. (fraction 2) and by recovery of the residue after these separations (fraction 3). Five groups each of 6 rats one month old were given diets the basis of which was a mixture of maize starch 60, casein 12, sucrose 10, salt mixture 4 and vitaminised starch 4 per cent.; the remaining 10 per cent. was supplied by the whole butterfat, by one of the 3 fractions or, in a no-fat group, by extra starch. Feeding to appetite continued for 6 weeks with records of food consumed; at the end of that time the rats were killed and livers were analysed for vitamin A and lipids.

Growth was best with fraction 3 as source of glyceride, was less but similar with fraction 2 or the whole fat, and least with fraction 1 or with no added fat. Fraction 3 favoured storage of vitamin A in the liver to a degree almost equal to that of the

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whole fat; fractions 2 and 1 were less favourable in that order. Lipids in the liver did not differ significantly in amount.

From estimation of the iodine values of the fractions their nutritive values were found to increase in parallel with their degree of unsaturation.—D. Harvey.

4808

CUNNINGHAM, H. M. and LOOSLI, J. K. **The effect of fat-free diets on young dairy calves with observations on metabolic fecal fat and digestion coefficients for lard and hydrogenated coconut oil.** *J. Dairy Sci.*, 1954, **37**, 453-461. [Lab. Animal Nutrit., Cornell Univ., Ithaca, N.Y.]

Dairy calves fed on a fat-free synthetic milk from 1 or 2 days of age developed leg weakness and muscular twitches within 1 to 5 weeks, and died unless fat was supplied. The condition was cured by 4 per cent. and prevented by 2 per cent. lard added to the milk. Two per cent. hydrogenated coconut oil also prevented the condition, and it was concluded that the early deaths were not due to deficiency of essential fatty acids. The study suggested that the calf's body stores of essential fatty acids at birth are sufficient for several months, but diet fat is necessary for the first few days of life.

Total plasma lipid values varied directly with the amount of fat in the diet, but linoleic and arachidonic acids were lower in calves getting hydrogenated coconut oil or fat-free diets than in those getting lard. The diet had no effect on plasma linolenic acid values.

The percentage digestibility of lard at 2, 4, 6 and 11 weeks was 72.6, 77.0, 92.5 and 93.7, and of coconut oil 86.4, 84.7, 85.5 and 71.9, respectively. The excretion of metabolic faecal fat during the seventh and eighth weeks on a fat-free diet was from 19 to 29 mg. daily per kg. bodyweight.

T. D. Bell.

4809

LAMBERT, M. R., JACOBSON, N. L., ALLEN, R. S. and ZALETEL, J. H. **Lipid deficiency in the calf.** *J. Nutrition*, 1954, **52**, 259-272. [Iowa Agric. Exp. Stat., Ames.]

Twenty dairy calves were removed from their dams at birth or after a short suckling period and were then fed on a semi-synthetic milk containing lactose 5.0, casein 3.5, fat 0 to 3.0 and salts 0.2 per cent., with vitamins and, in some of the fat-containing preparations, lecithin. In one group 5 calves received the fat-free semi-synthetic milk for 8 weeks and 3 for 12 weeks. Other groups of calves received the same synthetic milk into which had been incorporated hydrogenated soya bean oil, butter fat or free fatty acids (Emersol 9305).

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The calves were weighed weekly and blood samples were taken for estimation of total fatty acids, "Allen fat", phospholipins and linoleic, linolenic and arachidonic acids.

After 3 weeks on the lipid-free diet a marked retardation of growth was noted; after 8 weeks about half the calves showed signs of lipid deficiency, including diarrhoea, scaly dandruff, long, dry hair and loss of hair on the back, shoulders and tail. Recovery was readily promoted by adding butterfat or hydrogenated soya bean oil and lecithin to the synthetic milk; response was less when hydrogenated soya bean oil was given without lecithin.

Plasma fat, total fatty acids, phospholipins and linoleic acid were significantly lower in calves fed on the lipid-free milk than in calves given fat. There was little difference in the plasma content of linolenic and arachidonic acids.—G. A. Garton.

4810

HANSEN, A. E., SINCLAIR, J. G. and WIESE, H. F. **Sequence of histologic changes in skin of dogs in relation to dietary fat.** *J. Nutrition*, 1954, **52**, 541-554. [Dept. Paediat., Univ. Texas Med. Branch, Galveston.]

Eight littermate puppies and 4 littermate dogs aged 10 months were maintained as before (Hansen and Wiese, *Texas Rep. Biol. Med.*, 1951, **9**, 491). At 6 weeks of age 4 of the 8 puppies were given the control diet containing 29 per cent. of the energy as fresh lard and 4 the low-fat diet in which fat provided 1 per cent. of the energy. The 4 dogs had previously been maintained on the low-fat diet for 9 months and showed typical signs of fat deficiency; 3 were given diets in which 29 per cent. of the energy, previously provided by sucrose, was replaced by energy from fat in the form of fresh lard, cocoa butter and an oil emulsion; the fourth remained on the low-fat diet. At intervals of 4 weeks skin samples were taken from the thigh and chest of each animal for microscopic examination.

Details are given of the histological structure of the skin of the control and fat-deficient puppies and of that of the dogs recovering from fat deficiency. The maximum changes which occurred during deficiency were visible within 6 months; there was remarkable uniformity in the changing microscopic appearance of the skin during increasing deficiency states and recovery therefrom. Alterations in stratum corneum, collagen structure, cellular infiltrate of the dermis, hair follicles, sebaceous glands and sudoriparous glands were all related to changes in epidermis and particularly to the number of cell layers. Restoration to normal was most rapid when the fat in the diet was high in unsaturated fatty acids.—G. F. Garton.

4811

- PANOS, T. C. and FINERTY, J. C. **Effects of fat-free diet on growing male rats.** *Federation Proc.*, 1954, **13**, 471-472. [Dept. Paediat., Univ. Texas Med. Branch, Galveston.]

4812

- BATES, M. W., MAYER, J. and NAUSS, S. F. **Fat metabolism in three forms of obesity.** *Federation Proc.*, 1954, **13**, 450-451. [Dept. Nutrit., Harvard Sch. Pub. Health, Boston, Mass.]
Experiments with mice.

4813

- ALONSO, L. G. and MAREN, T. H. **Effect of dietary restriction on fat content of obese mice.** *Federation Proc.*, 1954, **13**, 331. [Chemotherap. Div., Stamford Res. Labs., American Cyanamid Co., Stamford, Conn.]

4814

- WADDELL, W. R., GEYER, R. P., CLARKE, E. and STARE, F. J. **Function of the reticuloendothelial system in removal of emulsified fat from blood.** *Amer. J. Physiol.*, 1954, **177**, 90-94. [Dept. Nutrit., Harvard Sch. Pub. Health, Boston, Mass.]

4815

- PIERCE, F. T. (Jr.) **The interconversion of serum lipoproteins in vivo.** *Metabolism*, 1954, **3**, 142-153. [Div. Med. Phys., Univ. California, Berkeley 4.]

Lipoproteins of classes S_f 5 to 15, 15 to 20 and 20 to 100 were isolated from the blood of normal rabbits fed on stock pellets supplemented with cholesterol, and of classes S_f 100 to 400 and 400+ from alloxan-diabetic rabbits fed on the same diet. The lipoprotein fractions were injected into normal rabbits, from which blood samples were taken at intervals from 5 min. to 14 days afterwards.

Lipoproteins of all the other classes were gradually converted into S_f 5 to 15, with a peak of conversion 18 to 24 hr. after injection. There was never conversion from a lower to a higher class. With each step in conversion from a high to a lower class part of the lipoprotein disappeared; i.e., an injection of S_f 100 to 400 lipoprotein was followed by a smaller increase in 20 to 100 and a still smaller increase in 15 to 20. The disappearance of injected S_f 5 to 15 lipoproteins was slower than conversion of higher to lower classes.—D. Duncan.

4816

- GEYER, R. P., SHOLTZ, K. J. and RYAN, M. A. **Fatty acid metabolism and intracellular K^+ and Na^+ .** *Federation Proc.*, 1954, **13**, 458. [Dept. Nutrit., Harvard Sch. Pub. Health, Boston, Mass.]

4817

- CONIGLIO, J. G., ANDERSON, C. E. and ROBINSON, C. S. **Disposition of biosynthesized fatty acids in normal and fasted rats.** *Amer. J. Physiol.*, 1954, **177**, 69-72. [Dept. Biochem., Sch. Med., Vanderbilt Univ., Nashville, Tenn.]

Radio-active acetate was injected intravenously into 2 groups of rats which had been fed on dog chow to appetite before the injections or fasted for 72 hr. All animals were then allowed to eat a fat-free, high-carbohydrate diet until they were killed 24 hr. later. Lipids were extracted from tissues and fractionated as previously described (Abst. 693, Vol. 21). The distribution of labelled fatty acids between neutral fat and phospholipins was noted.

No significant difference was observed between fasted and fed animals. In the liver the ratio of labelled neutral fatty acids to phospholipin fatty acids was about 1.0, though intestinal phospholipin fatty acids had a higher specific activity than the acids of the neutral fat. The ratios in intramuscular and subcutaneous fat (1 to 2 and < 1 , respectively), showed that a different type of association of lipids was found in these fat depots. The total ^{14}C excreted as faecal fatty acids was similar in starved and fed groups, but the specific activity of the fatty acids was greater in the starved rats.—G. A. Garton.

4818

- HAGEN, P. and ROBINSON, K. W. **Observation on the metabolism of short chain saturated fatty acids by guinea-pig caecal tissue.** *Austral. J. Exp. Biol. Med. Sci.*, 1954, **32**, 129-132. [Dept. Physiol., Univ. Queensland.]

Guineapig caecal tissue was incubated at 37°C. in Krebs Ringer phosphate buffer at pH 7 in the presence of the Na salts of acetic, propionic, butyric, valeric, caproic and heptonic acids. Oxygen consumption was measured and ketone body production estimated after 3 hours' incubation.

Small quantities of ketone bodies were produced in the absence of the salts of fatty acids; the formation of ketone bodies was increased in the presence of butyrate and caproate. Propionate was antiketogenic. Oxygen consumption was increased in the presence of butyrate and, to a less extent, in the presence of caproate.

G. A. Garton.

4819

- WEITZEL, G., SCHÖN, H. and KALBE, H. **Fütterungsversuche mit normalen und verzweigt-kettigen Fettsäureamiden. [Feeding experiments with amides of normal and branched-chain fatty acids.]** *Hoppe-Seyler's Ztschr.*, 1953, **295**, 173-187. [Biochem. Abt., Med. Forschungsanst., Max-Planck-Gesellsch., Göttingen.]

Dogs were fed on amides and N-methylamides of *n*-decanoic and *n*-dodecanoic acids and amides of 2-methylnonanoic, 4-methyldodecanoic, 2-methyltridecanoic and 5-methyltetradecanoic acids. Unabsorbed amides were estimated in the faeces and breakdown products were extracted from the urine with ether, esterified and separated by paper chromatography.

The N-methylamides of decanoic acid and dodecanoic acids were better absorbed than the corresponding normal amides. Methyl branched-chain amides produced a greater excretion of dicarboxylic acids in the urine than did the straight-chain amides. The succinic acid excreted in the urine after straight-chain and to a lesser extent after branched-chain acid amides exceeded the amount usually present in normal urine.—W. Godden.

4820

HOLMAN, R. T. and GREENBERG, S. I. **Polyethenoid fatty acid metabolism. 7. Effect of oxidized linoleate preparations.** *Arch. Biochem. Biophys.*, 1954, **49**, 49–57. [Hormel Inst., Univ. Minnesota, Austin.]

Weanling male rats of the Sprague Dawley strain were fed on a fat-free diet for 2 months, by which time moderately severe signs of fatty acid deficiency were apparent. The animals, in groups of 4, were then given daily supplements for several weeks of ethyl linoleate, ethyl linoleate plus benzoyl peroxide, partly oxidised ethyl linoleate, ethyl linoleate peroxide, decomposed linoleate peroxide, reduced linoleate peroxide or conjugated ethyl linoleate. The rats were weighed periodically and water consumption was recorded; skin changes were recorded. At the conclusion of the feeding experiments the animals were killed and total carcass fatty acids were isolated; polyunsaturated fatty acids were estimated spectrophotometrically.

All the supplements which included ethyl linoleate, with or without peroxide, cured the fat deficiency signs and stimulated arachidonic acid synthesis. Animals given diets containing linoleate peroxide, reduced linoleate peroxide, decomposed linoleate peroxide and conjugated linoleate failed to synthesise arachidonic acid, their skin signs became more severe, growth was retarded and water consumption remained high. All these substances have in common conjugated double-bond systems. (For earlier papers in this series see Abst. 805, Vol. 19; 682, Vol. 20; 695, Vol. 21; 2439, Vol. 22 and 2934, Vol. 23.)

G. A. Garton.

4821

CHENG, A. L. S., RYAN, M., ALFIN-SLATER, R. and DEUEL, H. J. (Jr.) **The effect of fat level of the diet on general nutrition. 11. The protective effect of varying levels of ethyl linoleate**

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against multiple sublethal doses of X-irradiation in the rat. *J. Nutrition*, 1954, **52**, 637–643. [Dept. Biochem. Nutrit., Sch. Med., Univ. S. California, Los Angeles.]

Individually caged young male albino rats of the University of Southern California strain were fed from weaning on a fat-free diet until signs of essential fatty acid deficiency appeared. The animals were then distributed into 4 groups and kept on the same fat-free diet supplemented for 8 weeks in 3 groups with 10, 50 or 100 mg. ethyl linoleate per rat daily. Each group was then exposed to X-rays, 200 r weekly for 10 weeks; during and after exposure the supplementary feeding with linoleate was continued.

The percentage survival of rats in all groups which received linoleate was greater than in an unsupplemented control group and increased progressively with the amount of linoleate administered. It was concluded that the optimum amount required for protection against X-rays was about the same as that required to promote normal growth of young rats, *i.e.*, somewhat greater than 100 mg. ethyl linoleate per rat daily.

G. A. Garton.

4822

ANDREWS, J. S. (Jr.), TOVE, S. B. and LUCAS, H. L. **Effect of linoleic acid on turnover curves of liver fatty acids.** *Federation Proc.*, 1954, **13**, 175. [N. Carolina Agric. Exp. Stat., Raleigh.]

Experiments with rats.

4823

HUTCHENS, T. T., VAN BRUGGEN, J. T., COCKBURN, R. M. and WEST, E. S. **The effect of fasting upon tissue lipogenesis in the intact rat.** *J. Biol. Chem.*, 1954, **208**, 115–112. [Dept. Biochem., Med. Sch., Univ. Oregon, Portland.]

Groups of 3, 5, 2 and 2 adult male rats of the Sprague Dawley strain were fed as previously described (Abst. 2435, Vol. 22) and fasted for 1, 18, 96 and 240 hr., respectively. After fasting, the animals were each injected intraperitoneally with 22 μ C. acetate-1-¹⁴C; they were then confined in a narrow chamber which permitted little body movement. Four hr. later they were killed and the incorporation of labelled acetate into total fatty acid and total cholesterol fractions of the liver, gut, carcass and skin is reported.

All the tissues studied showed significant decreases in lipogenesis from acetate with extended fasting. Liver was the least active; the specific activities of both fatty acid and cholesterol fractions of gut lipids were notably high.

G. F. Garton.

4824

DAVISON, J. P. and ECKSTEIN, H. C. **Influence of fasting on lipide distribution in tissues and**

plasma in the rat. *Federation Proc.*, 1954, **13**, 197. [Dept. Biol. Chem., Univ. Michigan, Ann Arbor.]

4825

NIWA, M. **The effect of some substances on the starvation ketosis.** *Kitasato Arch. Exp. Med.*, 1953, **26**, 113-119. [Dept. Med. Chem., 2. Nat. Hosp., Tokyo.]

In groups of 4 female rats weighing from 120 to 180 g., ketosis was produced by fasting for 48 hr. Total ketone bodies were estimated by the method of Greenberg and Lester (Abst. 878, Vol. 14) in blood taken by cardiac puncture before and 1 and 2 hr. after injection of 0.4 ml. of a 1.5 M solution per 100 g. bodyweight of the K salts of several substances. Total fat and glycogen were estimated in the liver.

Succinate, fumarate and malate caused the total ketone bodies in the blood to decline by 30, 33 and 35 per cent., respectively. L-Aspartate, DL-aspartate and L-glutamate caused declines of 30, 16 and 36 per cent. With glucose, 0.75 M, the decrease was 35 per cent., but with 1.5 M KCl there was no effect. In individuals there was some direct correlation between the amount of fat in the liver and the amount of ketone bodies in the blood. Injection of CCl_4 decreased the total ketone bodies in the blood by 48 per cent.

E. M. Hume.

4826

SCHWARZ, K. **Influence of food supply and fat intake on dietary necrotic liver degeneration.** *Federation Proc.*, 1954, **13**, 477. [Nat. Insts. Health, Bethesda, Md.]

Experiments with rats.

4827

McLEAN, J. R. and BEVERIDGE, J. M. R. **Hepatic necrosis induced by dietary means. 8. The effect of feeding a diet free from fat at successive intervals to groups of weanling rats.** *J. Nutrition*, 1954, **52**, 499-506. [Dept. Biochem., Queen's Univ., Kingston, Canada.]

The diet low in methionine, cystine and α -tocopherol resembled that described earlier (Abst. 749, Vol. 23), but for different groups of rats it contained no fat or 5 or 7 per cent. lard.

In the first experiment none of 5 rats on fat-free diet developed liver necrosis in 172 days; with 5 per cent. fat all 5 rats died of liver necrosis in 38 to 157 days. In later experiments of slightly shorter duration, 104 to 126 days, some rats in each group on fat-free diet developed liver necrosis, and the incidence appeared to increase; 1 of 10, 3 of 10, 8 of 9 and 4 of 10 in successive experiments. The result does not agree with that reported earlier (loc. cit.). The percentage of necrosis and the

mean time of survival were identical in rats receiving fat in all these experiments.

It is suggested that changes in the intestinal flora might affect the incidence of liver necrosis.

D. Duncan.

4828

HARPER, A. E., BENTON, D. A., WINJE, M. E. and ELVEHJEM, C. A. **Lipotropic action of protein.** *Federation Proc.*, 1954, **13**, 460.

[Dept. Biochem., Univ. Wisconsin, Madison.]

Experiments with rats.

4829

BERNHARD, K. and RITZEL, G. Beiträge zur Pathologie des Fettstoffwechsels. Phytol, ein neuer lipotroper Faktor der Nahrung. [Contributions to the pathology of fat metabolism. Phytol, a new dietary lipotropic substance.] *Hoppe-Seyler's Ztschr.*, 1953, **295**, 187-197. [Physiol. Chem. Inst., Univ. Basle.]

Numerous experiments on young growing rats showed that phytol is a lipotropic factor. When given in small amounts, a dose of from 50 to 80 mg., or from 0.5 to 1.0 per cent. of a choline-free, carbohydrate-rich diet, it prevented or largely reduced the occurrence of fatty liver, which normally follows the intake of such a diet. Liver cholesterol remained within normal limits, but there were highly significant differences in neutral fat content of the liver between the control animals and those receiving phytol. This effect of phytol was demonstrated in both prophylactic and curative experiments. Isophytol also was effective, but oleyl alcohol was not. The lipotropic effect of phytol was confirmed by partial liver removal; the increase of total lipids in 13 rats after operation was on the average only 38 per cent. compared with 115 per cent. in controls. In explanation it is suggested that phytol plays the part not so much of a methyl donor as of an accelerator of the oxidation of fatty acids in the liver.—M. B. Richards.

4830

WARD, J., HASLAM, R. and SCHIFF, L. **Effect of choline deficiency and hepatic cirrhosis on absorption of fat in the rat.** *Proc. Soc. Exp. Biol. Med.*, 1954, **85**, 401-404. [Dept. Int. Med., Sch. Med., Univ. Cincinnati, Ohio.]

Young rats of Wistar strain were fed on the choline-deficient diet described by Hartroft *et al.* (Abst. 3240, Vol. 23); 13 rats received the diet for 72 days and 12 for 225 days. Pair-fed control animals were given the same diet with 15 mg. choline daily. After receiving the experimental diet the rats were fasted for 72 hr. and then each was given 1.3 g. cottonseed oil by stomach tube. Six hours later they were killed and the fat and free fatty acid contents of the digestive tract were

estimated. Lipids were estimated in blood taken from the heart, and the liver was examined microscopically.

Severe and prolonged choline deficiency, which manifested itself in fatty vacuolisation and cirrhosis of the liver, did not affect the rate of absorption of oil, the extent of intestinal hydrolysis or the level of serum lipids.—G. A. Garton.

4831

PITTONI, A. and ROSSI, C. R. Sul meccanismo d'azione dei fattori lipotropi. [Mode of action of lipotropic substances.] 3. Influenza della colina sul metabolismo intermedio dei lipidi nel fegato. [3. Influence of choline on intermediate metabolism of fats in the liver.] 4. Metabolismo lipidico epatico, metionina e inositolo. [4. Fat metabolism in the liver, methionine and inositol.] *Arch. Sci. biol., Bologna*, 1954, **38**, 26–32; 47–55. [Ist. Chim. Biol., Univ. Padua.]

See Title 4762, Vol. 23, and Abst. 2094, Vol. 24.

3. In rats on high-fat diet, 10 mg. choline daily caused in the liver increased oxygen consumption, and decreased R.Q. and total ketone bodies. It is suggested that choline increases the oxidation of fatty acids to ketones in the liver, and also increases glucose formation, but lipocaic favours the synthesis of ketones to glucose without intervening in the breakdown of fatty acids.

4. Methionine and inositol given by mouth to rats on a high-fat diet were similar in their action, causing a decrease in production of acetoacetic acid and of total ketone bodies, but no variation in the intensity of respiratory exchange or R.Q. The smallest effective doses were 10 mg. methionine and 5 mg. inositol daily.

These results indicate increased transformation of ketone bodies to glucose, a process involving neither consumption of oxygen nor production of CO₂. Comparing the effects of lipocaic, choline, methionine and inositol, it is concluded that they have only one action in common, that of increasing the transformation of ketone bodies to glucose. Lipocaic inhibits also the transformation of carbohydrates to lipids, and choline increases the oxidation of fatty acids to ketone bodies.

M. B. Richards.

4832

SHILS, M. E., STEWART, W. B. and DE GIOVANNI, R. Occurrence of fatty liver of portal type in rats on a corn diet and response to lipotropic agents. *Federation Proc.*, 1954, **13**, 478. [Dept. Pathol., Sch. Pub. Health, Columbia Univ., New York.]

4833

SHILS, M. E. and STEWART, W. B. Development of portal fatty liver in rats on corn diets ;

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response to lipotropic agents. *Proc. Soc. Exp. Biol. Med.*, 1954, **85**, 298–303. [Sch. Pub. Health, Columbia Univ., New York.]

Rats on a diet containing 76 per cent. maize and 3 per cent. casein consistently developed fatty livers, with accumulation of lipid predominantly in the portal areas. On a diet in which casein was the only protein and choline was lacking, rats of the same strain developed fatty livers with the lipid localised in the central areas. The preponderance of portal fat seemed to be related to the presence of maize in the diet. Methionine, choline and vitamin B₁₂ supplements reduced the liver lipid, but the effectiveness of vitamin B₁₂ varied in different animals, and methionine did not completely prevent accumulation of fat.

It is hoped that the ability to produce the portal type of fatty liver in the rat may help in the study of kwashiorkor.—M. B. Richards.

4834

ROSENMAN, R. H., FRIEDMAN, M. and BYERS, S. O. Intestinal absorption of cholesterol by the nephrotic rat. *Circulation Res.*, 1954, **2**, 256–257. [Harold Brunn Inst., Mount Zion Hosp., San Francisco, Calif.]

Seven-week old male rats of the Long Evans strain were used ; 1 group was rendered nephrotic by the intravenous injection of rabbit anti-rat-kidney serum. Ten days later these animals and a control group had cannulae inserted in their thoracic ducts. Each rat then received 100 mg. cholesterol dissolved in 3 ml. olive oil and thoracic lymph was collected for 2 following 24-hr. periods. Total cholesterol was estimated in the plasma before cannulation and subsequently in the thoracic lymph.

The results showed diminished absorption of cholesterol in nephrotic rats which could not be accounted for by decreased lymph flow or by deficiency of bile or bile acids.—G. A. Garton.

4835

SWELL, L., FLICK, D. F., FIELD, H. and TREADWELL, C. R. Effect of dietary fat on absorption of dietary cholesterol. *Federation Proc.*, 1954, **13**, 480. [Veterans Admin. Centre, Martinsburg, W. Va.]

Experiments with rats.

4836

ROSENMAN, R. H., BYERS, S. O. and FRIEDMAN, M. The effect of soybean sterols on the absorption of cholesterol by the rat. *Circulation Res.*, 1954, **2**, 160–163. [Harold Brunn Inst., Mount Zion Hosp., San Francisco, Calif.]

Adult male rats of the Long Evans strain were used. In acute experiments 14 animals with

thoracic duct cannulae were divided into 3 groups. At post-operative intervals of 24 and 48 hr. each of the animals in the control group received 3 ml. olive oil by stomach tube and each rat in the other 2 groups received 100 mg. soya bean sterols, mainly sitosterols, dissolved in 3 ml. olive oil. The control animals, group 1, were then given 100 mg. cholesterol in 3 ml. olive oil; the rats of group 2 each received 100 mg. cholesterol plus 100 mg. soya bean sterols in 3 ml. olive oil, and the rats of group 3 were each given 100 mg. cholesterol plus 500 mg. soya bean sterols in 3.5 ml. olive oil. Thoracic lymph was collected for 2 following 24-hr. periods from groups 1 and 2 and for 24 hr. from group 3 and were analysed for total cholesterol.

The total lymph cholesterol during the first 24 hr. was much the same in the lymph collected from the animals of all 3 groups.

In further experiments chronic high blood cholesterol was induced in rats by feeding them on a diet containing 2 per cent. cholesterol and 1 per cent. cholic acid. When this diet included also either 2 or 10 per cent. of soya bean sterols no protective effect on the development and severity of the high blood cholesterol was apparent.

G. A. Garton.

4837

SCHWENK, E., TODD, D. and FISH, C. A. **Studies on the biosynthesis of cholesterol. 6. Companions of cholesterol- C^{14} in liver perfusions, including squalene- C^{14} , as possible precursors in its biosynthesis.** *Arch. Biochem. Biophys.*, 1954, **49**, 187-206. [Worcester Found. Exp. Biol., Shrewsbury, Mass.]

Pig liver, 15 kg., was perfused with a mixture of pig's blood and White solution containing 15 mC. of carboxyl-labelled Na acetate- ^{14}C . The tissue was then hydrolysed with KOH and the unsaponifiable matter was extracted. It was dissolved in pentane and chromatographed on alumina, yielding *inter alia* 4 fractions which were given to rats; 3 of the fractions were converted to cholesterol. From one of them pure radioactive squalene was isolated.

It was concluded that, besides squalene, a number of other intermediates in the biosynthesis of cholesterol from acetate are present in the unsaponifiable matter of the perfused liver and possibly also in normal liver.—G. A. Garton.

4838

OKBY, R. **Use of food cholesterol in the animal body. Relation of other dietary constituents.** *J. Amer. Dietetic Assoc.*, 1954, **30**, 231-235. [Dept. Home Econ., Univ. California, Berkeley.]

4839

ABELL, L. L., MOSBACH, E. H., HALPERN, E. and KENDALL, F. E. **Cholesterol metabolism in the dog.** *Federation Proc.*, 1954, **13**, 172. [Columbia Univ. Res. Serv., Goldwater Mem. Hosp., New York.]

4840

COX, G. E., NELSON, L. G., WOOD, W. B. and TAYLOR, C. B. **Effect of dietary cholesterol on cholesterol synthesis in monkeys' tissue in vitro.** *Federation Proc.*, 1954, **13**, 31. [Dept. Pathol., Univ. N. Carolina, Chapel Hill.]

4841

BYERS, S. O. and FRIEDMAN, M. **Role of chylomicra in cholesterol transport.** *Federation Proc.*, 1954, **13**, 21-22. [Harold Brunn Inst., Mount Zion Hosp., San Francisco, Calif.] Experiments with rats.

4842

FEIGENBAUM, L., BYERS, S. O. and FRIEDMAN, M. **Role of reticulo-endothelial system and disposition of dietary cholesterol in various mammalian species.** *Proc. Soc. Exp. Biol. Med.*, 1954, **85**, 530-533. [Harold Brunn Inst., Mount Zion Hosp., San Francisco, Calif.]

Twenty-eight male rats of the Long Evans strain were each given 100 mg. cholesterol in 3 ml. olive oil by stomach tube on 2 successive days; of these 28, 13 received also 0.5 ml. of 20 per cent. Indian ink intravenously twice daily for 2 days. Similarly, of 18 male rabbits which were each given in the same form 400 mg. cholesterol per kg. bodyweight by stomach tube daily for 2 days, 10 received also 5 ml. of 20 per cent. Indian ink suspension intravenously daily for 2 days, and of 15 mature dogs, each of which was given 0.6 g. cholesterol in 10 ml. olive oil per kg. bodyweight by stomach tube daily for 2 days, 8 received also an intravenous injection of 1 ml. of 20 per cent. Indian ink solution per kg. bodyweight daily for 2 days. Blood samples were taken before and 48 hr. after the beginning of experiment and were analysed for total cholesterol and total lipids; chylomicron counts were also made.

The plasma lipid of all 3 species was similarly affected by the combination of ink injection and cholesterol administration; there was a marked increase in plasma cholesterol and total lipid content. In the rats and dogs given cholesterol alone, chylomicrons were absent from the plasma, but in the rabbits many were present; in all species large numbers of chylomicrons were observed in the plasma after cholesterol administration

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combined with Indian ink injections. It is suggested, therefore, that the reticulo-endothelial system plays an essential part in the transport of exogenously derived cholesterol.—G. F. Garton.

4843

FRIEDMAN, M., BYERS, S. O. and ROSENMAN, R. H. (with GUNNING, B.) **Observations concerning the production and excretion of cholesterol in mammals. 12. Demonstration of the essential role of the hepatic reticulo-endothelial cell (Kupffer cell) in the normal disposition of exogenously derived cholesterol.** *Amer. J. Physiol.*, 1954, **177**, 77–83. [Harold Brunn Inst., Mount Zion Hosp., San Francisco, Calif.]

For earlier papers of the series see Absts. 4675, Vol. 23; 2085 and 3179, Vol. 24.

Groups of rats were fed on basal diets supplemented with cholesterol given by stomach tube; other groups of rats were similarly treated but were given, in addition, peripheral or portal intra-venous injections of colloidal suspensions (e.g. Indian ink, chromium phosphate, iron oxide) to interfere with the functioning of the Kupffer cells of the liver. The animals were killed at intervals after treatment and the Kupffer cells were examined histologically for the presence of cholesterol; the blood was examined for the presence of chylomicrons and plasma cholesterol was estimated.

Cholesterol was detected in the Kupffer cells within 6 hr. after administration; more was found in these cells after 24 hr. and it was also present in hepatic cells. Injection of the colloidal suspensions led to reduction of deposition of cholesterol in the liver, to persistence of peripheral chylomicrons and to high values for plasma cholesterol.

It is concluded that the Kupffer cells play an important part in the normal disposition of dietary cholesterol.—G. A. Garton.

4844

SHULL, K. H., MANN, G. V., ANDRUS, S. B. and STARE, F. J. **Response of dogs to cholesterol feeding.** *Amer. J. Physiol.*, 1954, **176**, 475–482. [Dept. Nutrit., Harvard Sch. Pub. Health, Boston, Mass.]

Ten dogs were fed for several months on fixed daily amounts of synthetic diets containing 20 per cent. casein or α -protein and from 1 to 30 per cent. cholesterol. Total serum cholesterol and lipoproteins were estimated periodically in blood taken from animals in the post-absorptive state. Four of the dogs were examined *post mortem*.

In spite of the fixed daily cholesterol intakes, serum cholesterol levels in all the animals varied widely from week to week. There was great individual variation in the relation between the amount of cholesterol ingested and the serum cholesterol. No arteriosclerosis was found in the

4 animals examined after 11 to 22 weeks with grossly elevated blood cholesterol and lipoproteins. G. A. Garton.

4845

BOULANGER, P., PLUMMER, P. J. G., ANNAU, E. and RICE, C. E. **Parallel studies of complement and blood coagulation. 10. The effect of a high cholesterol diet.** *Canad. J. Comp. Med.*, 1953, **17**, 403–405. [Div. Animal Pathol., Canada Dept. Agric., Animal Dis. Res. Inst., Hull, Que.]

Guineapigs received for several months a pellet diet with added cholesterol in cottonseed oil. When they died or were killed all had moderate to severe fatty infiltration of the liver. Total and free cholesterol in the blood were above normal, but complement titres were not below those of controls; titres of the whole colony were low. Clotting times were prolonged in all animals, and just significantly longer in those receiving cholesterol.

It is concluded that the control of complement titre and blood coagulability by the liver were not affected by fatty infiltration.—D. Duncan.

4846

LIJO PAVIA, J. **Fondo de ojo en la hipercolesterolemia experimental. [Fundus of the eye in experimental hypercholesterolaemia.]** *Rev. Asoc. méd. argent.*, 1954, **68**, 9–13.

Four dogs were given a milk diet with additions of from 1 to 6 g. cholesterol daily. There were two constant manifestations in the fundus of the eye: arterial constriction, which was slowly reversible, and precipitation of crystals of cholesterol in the retina, which was rapidly reversible. Arterial constriction was the first sign to appear. If preventive measures were not taken it gradually intensified and persisted to the end of the experiment, which lasted 16 weeks. Crystals of cholesterol appeared in the retina between the third and fourth week, disappeared in 3 to 5 weeks when cholesterol ingestion was stopped, and reappeared 3 weeks later if it was resumed. In one dog given injections of a lipotropic substance there was no reappearance of the crystals.—M. B. Richards.

4847

GERTLER, M. M. and OPPENHEIMER, B. S. **The total cholesterol-lipid phosphorus ratio. Its significance in atherosclerosis.** *Geriatrics*, 1954, **9**, 157–162. [Coll. Phys. Surg., Columbia Univ., New York.]

A review in which evidence is adduced to support the hypothesis that the serum cholesterol: lipid P ratio is a good index of arteriosclerosis in males.—G. A. Garton.

4848

STRISOWER, B., GOFMAN, J. W., GALIONI, E. F., ALMADA, A. A. and SIMON, A. **Effect of thyroid extract on serum lipoproteins and serum cholesterol.** *Metabolism*, 1954, **3**, 218-227.

Thyroid extract was given to 19 schizophrenic patients aged from 19 to 49 years and 4 young normal subjects. Of the 19 patients, 11 completed the course of treatment, which consisted of one week on a dose of $3\frac{1}{2}$ grains desiccated thyroid daily, one week on 7 grains daily and 9 weeks on 10 grains daily. The other 8 patients had smaller amounts and the 4 normal subjects were given 3 grains daily for 2 to 3 weeks. Serum cholesterol was estimated by the method of Colman (to be published) and lipoproteins by an ultracentrifuge method.

During thyroid administration in all subjects serum cholesterol fell significantly; if returned to pre-treatment level when exogenous thyroid was withdrawn. In the 19 schizophrenics lipoproteins S_1 0 to 12 and 12 to 20 also fell. In the normal subjects S_1 0 to 12 lipoproteins fell but the effect on S_1 20 to 400 was not so significant.

In the 11 patients who took the full course of thyroid bodyweights fell by about 1 lb. per week during the 11 weeks, and the drop in lipotropic values may have been related to this. Protein-bound I was on the average 4 μ g. per 100 ml., showing that in that respect there was no hypofunction of the thyroid.

The suggestion is made that thyroid function may be inadequate with respect to lipid metabolism where cholesterol and lipoprotein values are high, but adequate in other respects. Alternatively, the thyroid effect on cholesterol may be pharmacological and unrelated to thyroid function. B. W. Simpson.

4849

RAULIN, J. (with MACAIRE, I. and DE SAINTAURIN, M. A.) **Rôle de la nature des lipides alimentaires dans l'action des surcharges de cholestérol sur la croissance du rat blanc.** [Role of the nature of the dietary lipids in the action of excess cholesterol on growth of the white rat.] *Arch. Sci. physiol.*, 1954, **8**, 107-151. [Lab. Biochim. Nutrit., C.N.R.S., Bellevue, Seine-et-Oise.]

Young albino rats were fed on fat-free diets or on diets including lard, copra-fat [? coconut oil], olive oil, sunflower seed oil, linseed oil and cod liver oil or fatty acids derived from these fats, in each case with or without the addition of amorphous cholesterol, 1 or 3 per cent. of the diet. Full details of the diets are given. The growth rate of the animals was measured by frequent weighings, extending in some cases over 150 days.

Growth was stimulated when excess cholesterol was present in the lipid-deficient diet or in the diet with lard. With any of the other fats excess cholesterol caused retardation of growth. In the presence of the corresponding fatty acids excess cholesterol produced toxic signs and many premature deaths; choline, but not inositol, prevented the toxic action of the cholesterol-fatty acid diets and re-established normal growth rate.

G. A. Garton.

4850

BEHER, W. T. and ANTHONY, W. L. **Prevention of the cholesterol type of fatty livers in mice by dietary dihydrocholesterol.** *J. Nutrition*, 1954, **52**, 519-524. [Edsel B. Ford Inst. Med. Res., Henry Ford Hosp., Detroit, Mich.]

Seven groups of male albino mice each of 7 to 9 animals of the Webster strain were used. Each group was fed for 3 weeks on a basal cholesterol-free diet supplemented as required with 1 per cent. cholesterol plus 0.25, 0.5 or 1.0 per cent. cholic acid with or without 2.5 per cent. dihydrocholesterol at each level of cholic acid. At the end of the feeding period the livers were removed and analysed for total cholesterol and total β -steroids.

With increasing amounts of dietary cholic acid significantly increased amounts of cholesterol and β -steroids were found. The addition of dihydrocholesterol to the diets containing cholic acid and cholesterol caused a decrease in the amounts of cholesterol and β -steroids. Under the conditions studied, the ratio total cholesterol : β -steroid varied little.—G. A. Garton.

4851

BEHER, W. T., ANTHONY, W. L. and GAEBLER, O. H. **Action of dihydrocholesterol on cholesterol type fatty livers.** *Federation Proc.*, 1954, **13**, 180. [Edsel B. Ford Inst. Med. Res., Detroit, Mich.]

Experiments with mice.

4852

ALFIN-SLATER, R. B., AFTERGOOD, L., WELLS, A. F., and DEUEL, H. J. **Development of a cholesterol fatty liver in rats fed an essential fatty acid deficient diet.** *Federation Proc.*, 1954, **13**, 174. [Dept. Biochem. Nutrit., Sch. Med., Univ. S. California, Los Angeles.]

4853

WOLDOW, A., CHAPMAN, J. E. and EVANS, J. M. **Fat tolerance in subjects with atherosclerosis: heparin effects upon lipemia, lipoproteins, and gamma globulin.** *Amer. Heart J.*, 1954, **47**, 568-579. [Dept. Med., Sch. Med., George Washington Univ., Washington, D.C.]

In 21 subjects with coronary artery disease, 3 hr. after a fat meal precipitable lipoproteins and

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lipids in the blood were higher than in normal subjects, and they remained high after 5 hr., when in normal subjects they were returning towards fasting values. Since intravenous injection of 25 mg. heparin accelerated the clearing of fat in normal subjects and initiated the response in subjects with coronary artery disease, it appears that heparin may be active in normal fat transport. γ -Globulin concentration was reduced by heparin both *in vivo* and *in vitro*, which suggests that a heparin-globulin reaction may occur in association with the clearing of fat. The observations show the need for further investigation of the role of plasma proteins in fat transport and atherosclerosis.—M. B. Richards.

4854

McMILLAN, G. C., WHITESIDE, J. H. and DUFF, G. L. **The effect of undernutrition on cholesterol atherosclerosis in the rabbit.** *J. Exp. Med.*, 1954, **99**, 261-274. [Dept. Pathol., Pathol. Inst., McGill Univ., Montreal.]

Groups of albino rabbits of the New Zealand strain were fed on a diet of commercial rabbit food supplemented, as required, with 0.5, 0.75 or 1.0 g. cholesterol per animal daily for varying periods of several months. The rabbits were weighed periodically and, in some experiments, serum cholesterol and serum lipid P were estimated at intervals. At the end of the experiment the animals were killed and the aortas were removed for assessment of the severity of the atherosclerotic lesions. Different experiments tested the effect of cholesterol feeding on (1) young, growing animals fed on a restricted diet, (2) young rabbits grossly underfed both before and during cholesterol feeding, (3) fully grown, mature rabbits which lost weight owing to restriction of food, and (4) rabbits which had been fed on cholesterol before food restriction.

No difference in aortic atherosclerosis was found between any of the groups fed on adequate diets and those given a restricted energy intake when the animals in both groups were given the same amount of cholesterol. No effect of undernutrition on the regression of atherosclerotic lesions was seen, although animals on restricted diet did show high blood cholesterol values.

G. A. Garton.

4855

DUFF, G. L. and MEISSNER, G. F. **Effect of choline on the development and regression of cholesterol atherosclerosis in rabbits.** *Arch. Pathol.*, 1954, **57**, 329-332. [Dept. Pathol., Pathol. Inst., McGill Univ., Montreal.]

Groups of young adult white rabbits were fed on commercial rabbit food for from 75 to 100 days; the diet was supplemented as required with 1 g.

cholesterol per animal daily and choline, 1 or 2 g. daily, was given by mouth to some of the cholesterol-fed rabbits. Blood was taken at frequent intervals for the estimation of serum cholesterol, lipid P and total fatty acids, and the animals were weighed periodically. At the end of the experimental period the aortas were removed and the degree of atherosclerosis was estimated visually.

The moderate or large amounts of choline given to the cholesterol-fed animals did not affect the development or regression of the lesions, nor did choline feeding affect the blood lipid picture.

In further experiments, choline, 3 g. per animal, was given daily for 5 months to rabbits which had previously been rendered atherosclerotic by continuous cholesterol feeding, but again no regression of the lesions was seen.—G. A. Garton.

4856

WISSLER, R. W., EILERT, M. L., SCHROEDER, M. A. and COHEN, L. **Production of lipomatous and atheromatous arterial lesions in the albino rat.** *Arch. Pathol.*, 1954, **57**, 333-351. [Dept. Pathol., Sch. Med., Univ. Chicago, Ill.]

Middle-aged, obese, male rats in 6 groups of 21 received diets of protein and carbohydrate composition similar to the average diet of 4 men who developed coronary thrombosis. Fat, choline and cholesterol intakes differed between groups, and 1 group received thiouracil. Three rats from each group were killed after 14 weeks; after 20 weeks 6 from each group were treated to produce high blood pressure and the experiment continued for another 20 weeks.

The rats steadily increased in weight, except that in the first 6 weeks the thiouracil group lost weight and appetite, which they regained when the thiouracil was temporarily reduced from 25 to 6.25 mg. daily. The treatment with anti-rat-kidney serum, salt and deoxycorticosterone acetate to produce high blood pressure also caused loss of weight, but no decrease in food intake.

Blood pressure tended to rise gradually in all groups, and particularly in the group specially treated to induce this rise. In 29 of the 93 rats which survived to the end of the experiment fat was visible in the walls of the coronary arteries. The incidence was highest in the rats on the hypertensive regimen, but there was no significant correlation between high blood pressure and visible lesions. The pathology of the rats is fully described.

A high serum cholesterol:lipid P ratio was significantly correlated with the incidence of lesions.—D. Duncan.

4857

ZILVERSMIT, D. B., SHORE, M. L. and ACKERMAN, R. F. **The origin of aortic phospholipid in rabbit atheromatosis.** *Circulation*, 1954, **9**, 581-585.

[Div. Physiol., Univ. Tennessee Sch. Med., Memphis.] Spanish summary.

Two groups of white New Zealand rabbits were fed for 5 months on a diet of 100 g. Purina rabbit chow per animal daily, supplemented with 1 g. cholesterol and 2.8 g. vegetable fat in the experimental group. At the end of the feeding period, 0.5 mC. of ^{32}P -labelled phosphate was administered intravenously to animals in both groups. Blood samples were taken 2, 4 and 6 hr. after the injections. After the last blood sample had been taken the animals were killed and their livers and thoracic aortas were removed for extraction of phospholipins and for the estimation of their specific radio-activity.

Increased amounts of phospholipins were found in the plasma and the aorta of the rabbits which had received cholesterol. The aortas of the cholesterol group were atheromatous and were found to effect the synthesis of phospholipins 5 times as rapidly as normal aortas. The results are discussed in relation to the mechanism of atherogenesis.—G. A. Garton.

4858

OPDYKE, D. F. and OTT, W. H. **Influence of source of cholesterol, grade of cottonseed oil, and breed on experimental avian atherosclerosis.** *Proc. Soc. Exp. Biol. Med.*, 1954, **85**, 414–415. [Merck Inst. Therap. Res., Rahway, N.J.]

On an atherogenic diet containing 2 per cent. cholesterol (Merck) and 5 per cent. refined cottonseed oil, 2 different strains of White Leghorn cockerels showed 65 and 67 per cent. incidence of aortic atherosclerosis, but the incidence in New Hampshires on the same diet was only 17 per cent. The strain of White Leghorns which gave 65 per cent. incidence under the above conditions had 79 per cent. incidence when cholesterol from a different source (Armour) was used, 81 per cent. when the original cholesterol was combined with de-stearinated cottonseed oil, and 95 per cent. when this oil was used with the Armour cholesterol. Different strains of chickens appear to differ in their susceptibility to aortic atherosclerosis on the same diet, and the atherogenic effect of a high cholesterol diet is influenced by the quality of both the cholesterol and the cottonseed oil which are used.—M. B. Richards.

4859

ANGERER, C. A., WORTMAN, B. and OGDEN, E. **Metabolic pattern of aortae of rats and rabbits on a cholesterol and oil diet.** *Federation Proc.*, 1954, **13**, 3–4. [Dept. Physiol., Ohio State Univ., Columbus.]

See also Absts. 4271, 4366, 4404, 4420, 4436, 4588, 4642, 4955, 4995, 5061, 5096–98.

MINERALS

GENERAL

4860

SCHWARTZ, M., RANDALL, H. T. and BODANSKY, O. **Nitrogen, fat, calcium, phosphorus and magnesium metabolic balances in totally gastrectomized humans.** *Federation Proc.*, 1954, **13**, 292–293. [Sloan-Kettering Inst. Cancer Res., New York.]

4861

BERGMAN, E. N. and SELLERS, A. F. **Studies on intravenous administration of calcium, potassium, and magnesium to dairy calves. 2. Some cardiac and respiratory effects.** *Amer. J. Vet. Res.*, 1954, **15**, 25–35. [Minnesota Agric. Exp. Stat., St. Paul.]

For part 1, see Abst. 2098, Vol. 24.

Methods were devised to record simultaneously right intraventricular pressure, electrocardiogram, phonocardiogram and pneumogram in dairy calves during continuous intravenous injection of Ca, K, Mg and oxalate.

Ca produced initial bradycardia, but terminal tachycardia and fibrillation followed. Atrioventricular block varied in severity, with occasional extrasystoles. There was a marked rise in right

ventricular systolic pressure. K produced progressive and uniform atrioventricular block and progressive decline in cardiac automaticity. P waves disappeared. Mg caused respiratory embarrassment, with atrioventricular and intraventricular conduction progressively and uniformly depressed. Ca appeared to antagonise Mg, but reciprocal antagonism was not evident. The effects of oxalate appeared to be opposite to those of Ca.—W. A. Greig.

4862

WOOLEY, J. G. and MICKELSEN, O. **Effect of potassium, sodium or calcium on the growth of young rabbits fed purified diets containing different levels of fat and protein.** *J. Nutrition*, 1954, **52**, 591–600. [Lab. Biochem. Nutrit., Nat. Inst. Health, Pub. Health Serv., U.S. Dept. Health, Bethesda, Md.]

See Abst. 3956, Vol. 24.

Control rabbits received the stock pellets described in the earlier paper. The experimental diet contained vitamin-free casein 20 or 30, maize starch 20, cellophane spangles 15, Wesson salt mixture 4, cottonseed oil in different amounts and sucrose to 100 parts, with vitamins. The salts

supplied K 0.6, Na 0.17 and Ca 0.57 per cent. Extra minerals replaced sucrose. Groups of 4 rabbits were used and experiments lasted 4 weeks.

On 20 per cent. casein diet increasing the fat content from 1 to 12 per cent. decreased growth; with 30 per cent. casein the mortality was high at all fat levels unless extra minerals were added. At both levels of casein and with 5 per cent. or more fat addition of Na 0.4, K 0.8 or Ca 0.73 per cent. gave growth rates increasing with the fat content; this was more pronounced at the higher casein level. Na and Ca were more effective than K. With 12 per cent. fat Na alone or all 3 minerals gave growth comparable to that on the stock pellets.

No explanation is found for these results.

D. Duncan.

See also Abst. 4962.

CALCIUM AND PHOSPHORUS

4863

SOBEL, A. E. and BURGER, M. **Studies of chondroitin sulfate in relation to the mechanism of calcification.** *Federation Proc.*, 1954, **13**, 300-301. [Dept. Biochem., Jewish Hosp., Brooklyn, N.Y.]

4864

WOLTERINK, L. F. and COLE, L. L. **Rate of absorption of radioactive calcium and strontium from the intestine.** *Federation Proc.*, 1954, **13**, 166-167. [Dept. Physiol. Pharmacol., Michigan State Coll., East Lansing.]

4865

NARAYANA RAO, M. **The effect of steam-volatile fatty acids on calcium metabolism in normal growing rats.** *Indian J. Med. Res.*, 1954, **42**, 37-42. [Lab. Food Technol., Indian Inst. Sci., Bangalore 3.]

The author's earlier work with De (see Abst. 1987, Vol. 23) was continued and 4 groups of rats, 3 of each sex, weighing 65 to 70 g., were the subjects of balance experiments in which butyric, *n*-caproic or *n*-caprylic acid formed 10 per cent. of the diet; a fourth group of control animals received no fatty acid but extra maize starch instead. The experiment continued for 7 days, after which the rats were killed and the pH of intestinal contents was measured at 3 levels, stomach and duodenum, jejunum and ileum. The utilisation of Ca was 46.8, 41.9, 40.6 and 39.1 per cent., respectively, in the control, caproic, caprylic and butyric acid groups. The trend towards alkalinity of the contents of jejunum and ileum was greater in the groups getting the acids than in the control group.

In a similar experiment in which the calcium soaps of these acids formed 4 per cent. of the diet

utilisation of Ca was 40.3, 37.7 and 36.2 per cent. for butyrate, caprylate and caproate, respectively; it was again in conditions of greater acidity that utilisation of Ca was best.—D. Harvey.

4866

THOMAS, R. O., LITOVITZ, T. A. and GESCHICKTER, C. F. **Alterations in dynamics of calcium metabolism by intraintestinal calcium reservoirs.** *Amer. J. Physiol.*, 1954, **176**, 381-387. [Med. Centre, Georgetown Univ., Washington, D.C.]

For previous work see Abst. 659, Vol. 23; the present experiments were designed to test the relation between the degree of activity of Ca metabolism and the rate of disappearance of Ca from the plasma.

In rabbits given a diet of spinach and water the rate of disappearance of injected ^{45}Ca from plasma was significantly increased after 18 days, and the rate of faecal excretion was increased. Uptake of ^{45}Ca by bone was lower than in rabbits on stock diet. It is concluded that the spinach diet brought about diversion of ^{45}Ca from bone to intestinal tract.

The Na salt of ethylene diamine tetra-acetic acid (versene) or excess Ca given by stomach tube also caused rapid disappearance of ^{45}Ca from the blood, but short-term experiments failed to show lower ^{45}Ca uptake by bone.

When $^{45}\text{CaCl}_2$ was injected into the duodenum radio-activity in the blood reached its peak after about 20 min. From 2 to 4 hr. afterwards ^{45}Ca in blood was about 50 per cent. higher than at the corresponding time after it was given intravenously, but the disappearance curves were parallel.

D. Duncan.

4867

ARNOLD, J. S. and JEE, W. S. S. **Ion exchange and recrystallization in fixation of Ca^{45} in the rabbit's skeleton.** *Proc. Soc. Exp. Biol. Med.*, 1954, **85**, 658-663. [Radiobiol. Lab., Coll. Med., Univ. Utah, Salt Lake City.]

Rabbits were killed at intervals between 1 hr. and 3 weeks after injection of radio-active Ca. The proportion of total radio-active Ca in bone of lumbar vertebrae which was exchangeable *in vitro* at the time of killing was measured. Reactions causing the conversion of exchangeable to non-exchangeable Ca proceeded rapidly; only 50 per cent. of the radio-active Ca retained by the bone remained exchangeable 1 hr. after injection.

R. Hill.

4868

ROSENTHALL, L. and MARVIN, J. F. **Effects of aureomycin and P^{32} on growth of young rats.** *Proc. Soc. Exp. Biol. Med.*, 1954, **85**, 379-381. [Dept. Radiol., Univ. Minnesota Hosp., Minneapolis.]

Experiments were designed to test the counter-acting effect of aureomycin on growth retardation induced in rats by a single intraperitoneal injection of ^{32}P , 2 μC . per g. Animals which received the injection without aureomycin showed generalised retardation of growth, evident from measurements of both weight and tibial length. The ratios of weight gain to increase in tibial length did not differ significantly from those of the control group, and indicated that no selective inhibition of bone growth had occurred after that dose of ^{32}P . Animals given a supplement of aureomycin-HCl, 2 mg. per g. food, after injection of ^{32}P showed complete weight recovery after 42 days. Addition of aureomycin to the basal diet stimulated growth initially, but did not significantly alter the ultimate weight of the animals. In both groups which received aureomycin the ratio of weight gain to increase of tibial length was higher than in the control group for all values of tibial length. Aureomycin therefore appears to favour formation of soft tissue rather than a uniform increase in growth.—M. B. Richards.

4869

MULLICK, D. N., MURTY, V. N. and KEHAR, N. D. **Seasonal variations in the nitrogen, calcium and phosphorus metabolism in cattle.** *J. Animal Sci.*, 1953, **12**, 951. *Proc.* [Indian Vet. Res. Inst.]

4870

MATHUR, M. L. and DESAI, S. V. **Studies on calcium and phosphorus in milk and feeds of Sahiwal cows from precalving period to the end of lactation.** *Indian J. Vet. Sci.*, 1953, **23**, 221-241. [Indian Agric. Res. Inst., New Delhi.]

Observations were made on the Ca and P content of milk from 4 high-, 4 medium- and 5 low-yielding Sahiwal cows from a few days before calving until the end of lactation. The Ca and P content of milk was low during the flush period of early lactation. High- and medium-yielding cows were in negative Ca and P balance longer than low yielders. Storage of Ca and P began when milk yields fell below 15 lb. daily. Different fodders in the green state or as silage had no effect on the mineral composition of the milk.

It is concluded that cows giving 20 lb. milk daily required at least 75 g. CaO and 80 g. P_2O_5 to prevent losses of these minerals.—J. N. Aitken.

4871

MATHUR, M. L. **Assimilation of phytin phosphorus by dairy cows.** *Indian J. Vet. Sci.*, 1953, **23**, 243-248. [Indian Agric. Res. Inst., New Delhi.]

Four high-yielding Sahiwal cows were given fodder to appetite and concentrates according to yield. Phytate phosphorus was estimated in food and faeces during 4 six-day periods for each animal.

The mean daily intake of phytate P was 19.6 g., 41.9 per cent. of which was recovered in the faeces. When the Ca : P ratio of the diet was high, recovery of phytate was generally high also.

R. Hill.

4872

DUCKWORTH, J. and HILL, R. **The effect of the level of dietary calcium during pregnancy and lactation on the skeleton of the ewe.** *J. Physiol.*, 1954, **123**, 69P-70P. [Rowett Res. Inst., Bucksburn, Aberdeenshire.]

4873

KEANE, K. W., COLLINS, R. A. and GILLIS, M. B. **Utilization of phytate and inorganic phosphorus in the chick as measured by P^{32} tracer studies.** *Federation Proc.*, 1954, **13**, 463. [Central Res. Lab., International Minerals and Chemical Corp., Skokie, Ill.]

4874

TAYLOR, T. G. and MOORE, J. H. **Skeletal depletion in hens laying on a low-calcium diet.** *Brit. J. Nutrition*, 1954, **8**, 112-124. [Dept. Agric. Chem., Univ. Reading.]

Eight pullets were fed on a stock diet; during the last 10 days before they began to lay they retained fairly large amounts of Ca and smaller amounts of P, the mean ratio of Ca : P retained being 4.25 : 1. The birds were then fed on a diet containing only 0.054 per cent. Ca and 2 were killed before they had laid, and other pairs after laying 2, 4 and 6 eggs, respectively. The Ca content of the shells produced by each bird became less with each egg laid, but no egg was described as soft-shelled. Losses of mineral matter from the skeleton during laying were large; according to analyses of the skeleton and balance data, losses of Ca from 2-, 4- and 6-egg birds were 16.3, 25.2 and 38.4 per cent., respectively, of that originally present in the skeleton.

Some bones were ashed individually or in groups, and medullary tissue was separated for analysis from cortical tissue. Loss of mineral matter was greatest from ribs, sternum, ilium, ischium and pubis, coccygeal vertebrae and fibula, all of which had lost over 50 per cent. when 6 eggs had been laid. Least mineral matter was lost from the skull, metatarsus and toes. The quantity of medullary bone ash was hardly affected, nearly all the loss being from cortical tissue ash.—R. Hill.

4875

MCCLENDON, J. F., SCHRAER, H. and GERSHON-COHEN, J. **Production of osteitis fibrosa**

N.A. and R., October 1954

cystica with a low calcium diet plus fluorine. *Federation Proc.*, 1954, **13**, 468. [Dept. Radiol., Albert Einstein Med. Centre, Philadelphia, Pa.]

Experiments with rats.

See also Absts. 4673-75, 4757.

MAGNESIUM

4876

MENAKER, W. **Influence of protein intake on magnesium requirement during protein synthesis.** *Proc. Soc. Exp. Biol. Med.*, 1954, **85**, 149-151. [Dept. Pathol., Coll. Phys. Surg., Columbia Univ., New York.]

The average weight gains in 10 days of protein-depleted adult rats on diets containing 7 or 14 per cent. protein were, respectively, 14.3 and 36 g. when a complete mineral supplement was given, but only 12.3 and 5.8 g. when the supplement lacked Mg. The small amount of protein synthesis on the 14 per cent. level when Mg was deficient indicates that more Mg was required for normal protein metabolism when protein intake was increased from 7 to 14 per cent. At the lower level the rate of protein synthesis is slow, and it is inferred that sufficient Mg is mobilised from body stores to enable the animals on the Mg-deficient ration to gain almost as much as those on the complete supplement, but at the higher level, which gives a more normal rate of protein synthesis, the amount thus mobilised is insufficient and the effects of Mg-deficient rations on protein synthesis are revealed.—M. B. Richards.

4877

BLAXTER, K. L., ROOK, J. A. F. and MACDONALD, A. M. **Experimental magnesium deficiency in calves. 1. Clinical and pathological observations.**

BLAXTER, K. L. and ROOK, J. A. F. **2. The metabolism of calcium, magnesium and nitrogen and magnesium requirements.** *J. Comp. Pathol.*, 1954, **64**, 157-175; 176-186. [Hannah Dairy Res. Inst., Kirkhill, Ayr.]

1. Seven calves were fed on whole milk for about 2 weeks, then on an artificial milk substitute which contained 0.5 mg. Mg or less per 100 ml., and to which Mg was added as required. Each calf received 12.5 or 19.0 mg. Mg per 100 ml. diet during a preliminary period, and this was followed by an experimental period when different animals received from 0.5 to 19.0 mg. Mg per 100 ml.

Three calves showed clinical signs of Mg deficiency and died in convulsions after 6 or 7 weeks on the experimental diet: 2 of these received only the basal diet and the other 1.64 mg. Mg per 100 ml. diet. The concentration of serum Mg had fallen to about 0.7 mg. per 100 ml. when tetany appeared and to 0.5 mg. at death.

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One calf received 5.8 mg. Mg per 100 ml. diet for about 10 weeks and showed no clinical sign of deficiency, but the serum Mg fell steadily to 1.0 mg. per 100 ml. Calves which received 12.5 or 19.0 mg. Mg per 100 ml. diet were clinically normal and serum Mg remained between 2.0 and 2.5 mg. per 100 ml.

The chief lesion seen *post mortem* in affected animals was haemorrhage, particularly in the heart and great vessels. Ca and Mg were estimated in soft tissues and bone. No difference was found between the Mg and Ca contents of soft tissues from normal and deficient calves, but bone Mg was partly replaced by Ca in deficient animals.

2. Balance data for Mg, Ca and N on the calves described in the previous paper are presented.

During the 6 or 7 weeks on the low-Mg diet before death occurred each calf lost about 2 g. Mg; normal animals gained about 7 g. during the same time. Mg deficiency had no effect on Ca and N metabolism, and in normal animals the ratios Mg:N and Mg:Ca retained remained so constant that Mg retention could be calculated from Ca and N retentions.

It was estimated that about 35 per cent. of body Mg had been lost when death occurred. This was higher than the result obtained from analysis of soft tissues and bone.

The Mg requirement of a growing calf was estimated to be 16 to 18 mg. Mg per 100 ml. diet.

R. Hill.

4878

CONSTANT, M. A. and PHILLIPS, P. H. (with CRAIG, J. A.) **The occurrence of a calcinosis syndrome in cotton rats. 4. The effect of diet and the age of the animals on the development of the disease and on the urinary excretion of various metabolites.** *J. Nutrition*, 1954, **52**, 165-186. [Dept. Biochem., Univ. Wisconsin, Madison.]

Diets containing only 0.02 per cent. Mg produced the calcinosis syndrome in cotton rats more quickly and severely than diets containing 0.1 per cent. Mg. On the low-Mg diet phosphates appeared in urine at once and creatine excretion increased from about the second week. Supplementation with biotin, aureomycin, vitamin A, Ca pantothenate, vitamin E, Mn, Zn, or methionine, or omission of the vitamin D supplement, did not improve growth or reduce deposition of minerals in cardiac and abdominal muscles. Some supplements reduced loss of both phosphate and creatine, but less effectively than a supplement of Mg. Substitution of dextrin for sucrose in the basal low-Mg diet retarded the development of the disorder.

Besides similarities previously reported between the disorder in guineapigs and cotton rats, several other similarities were observed in the present

studies. Adults were less susceptible to calcinosis than animals either 3 weeks or 2 months old.

M. B. Richards.

See also Abst. 5166.

SODIUM, POTASSIUM, AND SODIUM CHLORIDE

4879

TRÉMOLIÈRES, J. and DERACHE, R. Données actuelles sur le métabolisme du sodium et du potassium. [**Present knowledge of sodium and potassium metabolism.**] *Presse méd.*, 1954, **62**, 534-536. [Inst. Nat. Hyg., Paris.]

A review, with references.

4880

NICHOLS, G. (Jr.) and NICHOLS, N. **Changes in tissue composition during acute sodium depletion.** *Federation Proc.*, 1954, **13**, 470. [Dept. Med., Harvard Med. Sch., Boston, Mass.] Experiments with dogs.

4881

MENEELY, G. R., TUCKER, R. G., DARBY, W. J., BALL, C. O. T., KORY, R. C. and AUERBACH, S. H. **Electrocardiographic changes, disturbed lipid metabolism and decreased survival rates observed in rats chronically eating increased sodium chloride.** *Amer. J. Med.*, 1954, **16**, 599. *Proc.* [Radioisotope Unit, Thayer Veterans Admin. Hosp., Nashville, Tenn.]

4882

FIELD, H. (Jr.), SWELL, L., FLICK, D. F. and DAILEY, R. E. **Cation uptake by exchange resin in vitro and the colon as a sodium-conserving organ.** *Circulation*, 1954, **9**, 32-37. [Gen. Med. Serv., Veterans Admin. Centre, Martinsburg, W. Va.] Spanish summary.

When a carboxylic cation exchange resin was equilibrated *in vitro* with a solution of the approximate electrolyte composition found in the contents of the terminal ileum, it absorbed much more Na and much less K than was found, per g. resin, in the faeces of 5 patients over prolonged periods. It appears that the colon has power to absorb Na sufficient to overcome the affinity of the resin for Na, and that it has a role in the conservation of Na almost comparable in many patients to that of the kidney. The colon does not absorb K as actively as it does Na; it gives up large amounts of K to the resin. Neither colon nor kidney is an effective conserver of K.—M. B. Richards.

4883

EICHNER, D. Zur Therapie mit Kationenaustauschern. Untersuchungen über die Beteiligung der Nebennieren. [**Treatment with cation exchange substances. Participation of the**

adrenals.] *Deutsch. med. Wochenschr.*, 1954, **79**, 979-980. [Inst. Anat., Univ. Kiel.]

Rats were given either a low-Na diet with 10 per cent. by weight of a cation exchange resin, or drinking water with 2 to 2.5 per cent. NaCl. Deprivation of salt increased activity in the zona glomerulosa of the adrenal cortex and reduced that in the neuro-secretory zone of the mid-brain. Excess of salt reversed these effects.—I. Leitch.

4884

ABBOTT, W. E., KRIEGER, H., BABB, L. I., LEVEY, S. and HOLDEN, W. D. **Metabolic alterations in surgical patients. 1. The effect of altering the electrolyte, carbohydrate and amino acid intake.** *Ann. Surg.*, 1953, **138**, 434-451 (with discussion 451-452). [Dept. Surg., W. Reserve Univ., Cleveland, Ohio.]

The studies were of 12 surgical patients of both sexes undergoing major abdominal operations, either electively or in emergency; in the former, metabolic studies were begun before the operation.

Four of 5 patients given no K lost more K than healthy subjects on K-deficient diet (Abst. 2003, Vol. 23). The greatest losses were in 2 patients with strangulated intestinal obstruction. In all, the serum K levels fell only gradually and slightly and when K was given after the third post-operative day marked K retention followed. When K was given soon after operation it failed to prevent some loss of body K, but after the first 3 to 5 days repletion was rapid, and usually an excess was stored. There was little relation between energy and N metabolism and K status. Pyruvate curves after glucose tolerance tests were higher than normal in several patients, and glucose tolerance was often disturbed, but these phenomena were thought to be due to "stress" rather than to mineral deficiency.

Patients with the highest energy intake lost least weight during intravenous feeding. It is recommended that in most patients unable to take food by mouth for more than a few days, invert sugar or fructose plus amino-acids, vitamins and minerals should be given parenterally. Moderate amounts of saline were well tolerated.—D. Duncan.

4885

EVANS, B. M., JONES, N. C. H., MILNE, M. D. and STEINER, S. **Electrolyte excretion during experimental potassium depletion in man.** *Clin. Sci.*, 1954, **13**, 305-316. [Dept. Med., Postgrad. Med. Sch., London.]

For each of 2 healthy men there were three 9-day periods of K depletion produced by a K-low diet and administration of cation exchange resin. The same subjects and one other served as normal controls. In the normal subjects hyperventilation, osmotic diuresis from intravenous mannitol, and

ingestion of sodium bicarbonate, carbonic anhydrase inhibitor and potassium chloride increased output of K in urine. During K depletion output of K in response to these stimuli was much less. Diurnal variation in K excretion was less during K depletion than in normal controls; citrate excretion was not reduced.—F. C. Aitken.

4886

SCHWARTZ, W. B., LEVINE, H. D. and RELMAN, A. S. **The electrocardiogram in potassium depletion. Its relation to the total potassium deficit and the serum concentration.** *Amer. J. Med.*, 1954, **16**, 395-403. [Med. Serv., New England Centre Hosp., Boston, Mass.]

Electrolyte and N balances were studied in relation to electrocardiograms of 9 normal subjects in whom K depletion was produced by deoxycorticosterone acetate, 17-hydroxycorticosterone acetate, ammonium chloride or ammonium sulphate, and 2 patients with chronic K depletion induced by excessive use of laxatives.

No consistent correlation was found between body K stores and the electrocardiogram. The serum K concentration was a reliable guide to K depletion, the electrocardiogram was not.

D. Duncan.

4887

BLACK, D. A. K. and MILLS, J. N. **Nocturnal electrolyte excretion after oral administration of sodium and potassium chloride and bicarbonate.** *Clin. Sci.*, 1954, **13**, 211-219. [Dept. Med., Univ. Manchester.]

Five normal men were given at bedtime 50 m. equiv. NaCl, NaHCO₃, KCl or KHCO₃ and the urinary output of electrolytes during the night was measured and compared with control output in the same subjects. H ion output, calculated as the sum of ammonium and titratable acid less bicarbonate, was depressed by both K and HCO₃ ions. Na salts did not alter other outputs consistently. K salts increased output of Na even more than output of K. KCl and KHCO₃ were equally effective. In all experiments taken together increase in output of (K + H) was positively correlated with increase in difference of (Cl—Na). Output of (K + H) when chlorides were given was higher than with bicarbonates, and with K salts (K + H) output was higher than with Na salts. There was a negative correlation between K and H outputs when a salt was given which altered the output of one of these ions.

The results are discussed.—F. C. Aitken.

4888

LOVE, W. D., ROMNEY, R. B. and BURCH, G. E. **A comparison of the distribution of potassium**

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and exchangeable rubidium in the organs of the dog, using rubidium⁸⁶. *Circulation Res.*, 1954, **2**, 112-122. [Dept. Med., Sch. Med., Tulane Univ., New Orleans, La.]

Eighteen dogs received single intravenous injections of 50 mC. ⁸⁶Rb as carbonate in 0.15 M saline and were killed 7 min. to 7 days later. Samples of body organs and fluids were taken immediately and analysed for total K by flame photometer and for ⁸⁶Rb by a Geiger Müller tube.

The rate of ⁸⁶Rb turnover varied from organ to organ, but absolute values were not considered reliable. The mean relative ⁸⁶Rb concentration (average of the ratios of organ ⁸⁶Rb : K to plasma ⁸⁶Rb : K × 100 estimated 1, 3 and 7 days after injection) varied from 102 to 191 per cent. in 28 of 30 organs, but was only 56 per cent. in femur and 55 per cent. in brain. A "lag phenomenon" resulted in higher ⁸⁶Rb specific activity in the myocardium than in plasma. It is suggested that because of the similarity of the ⁸⁶Rb and K concentrations in most organs, ⁸⁶Rb might be useful as a tracer of K in experiments requiring prolonged observation.—W. Godden.

4889

DE LANGEN, C. D. **1. Sodium chloride and geographical pathology. 2. Sodium chloride and capillary system.** *Doc. Med. geogr. trop.*, 1953, **5**, 323-325; 325-328. [13 Maliesingel, Utrecht.]

1. The distribution is discussed of a group of diseases which are neither true deficiency diseases nor infectious or parasite infestations, but occur mostly in association with disturbances of the peripheral circulatory system. In the study of the geographical pathology of these diseases, great differences in the dietary intake of NaCl became apparent. Some peoples used no more than 4 g. daily, and others used between 10 and 20 g., which it is suggested is excessive.

2. A short general discussion of NaCl metabolism is illustrated by an experiment on a young, healthy man who was given for 14 days a daily diet of meat 1000, NaCl 15, bread 100 and cheese 30 g. and all vitamins in tablets. The capillaries, examined in the nail bed and skin of the arm and chest, became coarse and thickened. B.M.R. increased to +19 per cent., and blood pressure from 125/80 to 140/90. After a month on a diet with 2 g. NaCl daily, all the signs regressed, but they recurred to some extent when the subject took a normal diet containing 23 g. NaCl. Administration to another subject of a rice diet with a Turkish bath twice daily reduced the B.M.R. to -8 per cent., and caused dilatation of the capillaries with a sluggish flow. Addition of NaCl and suspension of the Turkish baths reversed the changes.

The author concludes that NaCl plays an important part in the physiology of the capillaries.

E. M. Hume.

4890

PULLMAN, T. N. and MCCLURE, W. W. **The relative roles of sodium and chloride in the salt-retaining action of desoxycorticosterone in man.** *Metabolism*, 1954, **3**, 240-246. [Dept. Med., Univ. Chicago, Ill.]

4891

TUCKER, R. G., DARBY, W. J. and MENEELY, G. R. **Effect of dietary NaCl on ultimate size, blood pressure and organ weight of rats.** *Federation Proc.*, 1954, **13**, 480-481. [Dept. Biochem., Sch. Med., Vanderbilt Univ., Nashville, Tenn.]

4892

MOORE, F. D. **Bone sodium.** *Ann. Surg.*, 1954, **139**, 253-255.

4893

WOOLEY, J. G., KEITEL, H. and MICKELSEN, O. **Effect of potassium, sodium or calcium on the growth of young rabbits fed a purified diet containing different levels of fat and protein.** *Federation Proc.*, 1954, **13**, 482. [Nat. Insts. Health, Bethesda, Md.]

See also Absts. 4930, 4987, 5098, 5423.

HALOGENS

4894

HELD, H. R. **Fluormedikation und Blutfluor.** [Fluorine medication and blood fluorine.] *Schweiz. med. Wochenschr.*, 1954, **84**, 251-254. [Frauenklin., Univ. Zürich.]

Fluorine was estimated in the blood of 6 subjects before and after daily treatment for from 7 to 21 days with 2.5 mg. F, followed in some by 1.5 mg. for up to 32 days. Values before treatment, in mg. F per 1000 ml., ranged from 0.185 to 0.242, and after treatment from 0.238 to 0.294. Values for persons having a diet low in F ranged from 0.172 to 0.389. The danger level is considered to lie about 0.4 mg. per 100 ml., and doses greater than 1.5 mg. daily should not be given for any length of time; 1.0 mg. daily is the dose recommended. Estimation of F in the blood of 32 mothers treated with F for from 4 to 21 days before parturition and in the blood of their newborn infants confirmed the previous finding that F passes the placenta (Abst. 920, Vol. 22). The values ranged for the mothers from 0.206 to 0.294, and for the infants from 0.199 to 0.265; in 18 the value for the infant was higher than for the mother and in 14 it was lower.—E. M. Hume.

4895

ODELL, R. T. and KEY, J. A. **The effect of chronic fluorine intoxication upon the healing of experimental fractures in rats.** *Ann. Surg.*, 1953, **138**, 461-466 (with discussion 466). [Dept. Surg., Sch. Med., Washington Univ., St. Louis, Mo.]

Rats which were either half-grown or adult were in 2 groups; one received water to which NaF, 226 p.p.m., was added, and each animal was thought to have consumed about 4 mg. NaF daily; the other was a control group with no additional F. In all the right humerus was broken. Some of the treated animals were given F for 30 days before fracture, others were given F only from that time. Full descriptions of macroscopic, microscopic and X-ray findings at different intervals after fracture are presented. The evidence was not only of no inhibition of the rate of repair, but of some slight favourable influence on the process in the treated animals.—D. Harvey.

4896

BIXLER, D., MUHLER, J. C. and SHAFER, W. G. **Experimental dental caries. 5. The effects of desalivation and castration on caries and fluorine storage in the rat.** *J. Nutrition*, 1954, **52**, 345-353. [Indiana Univ., Bloomington.]

Rats, male and female, aged about 26 days were grouped, 38 as controls, 32 castrated, 32 desalivated and 31 after both operations. They were given a caries-producing diet (see Abst. 5468, Vol. 20) with 0.3 p.p.m. F. After 140 days they were killed. The incidence of caries was lower by 38 per cent. in castrated rats and higher in desalivated rats by about 60 per cent. than in the control animals. In the group which had undergone both operations the number of lesions was fewer than in the desalivated group but their severity was similar. Storage of F was greatest in the control group, much lower in the castrated and desalivated groups and least after combined treatments. Desalivation by itself diminished the rate of growth in both sexes, in males more than in females.

In a second pair-feeding experiment in which 70 rats were divided into control and desalivated groups and in which the F content of the diet was 0.6 p.p.m. it was found that the difference in storage of F could be explained on the basis of total food consumption. The final weight of desalivated rats was again lower than that of controls, and further study is thought desirable.

D. Harvey.

4897

GRIFFITH, J. M., HARDIN, L. J., HOBBS, C. S. and KEMP, H. N. **The effects of feeding various levels of fluorine to lambs as measured by**

metabolism studies, feeding trials and bone and other tissue storage. *J. Animal Sci.*, 1953, **12**, 917. *Proc.* [Univ. Tennessee.]

4898

HOBBS, C. S., PARDUE, J. B., BELL, M. C., WEST, J. L., MOORMAN, R. P. and MERRIMAN, G. M. Various effects of high levels of fluorine ingested as sodium fluoride on pregnant beef heifers. *J. Animal Sci.*, 1953, **12**, 920-921. *Proc.* [Univ. Tennessee.]

4899

VAN MIDDLESWORTH, L. and INTOCCIA, A. Iodide metabolism on low iodide goiter-producing diet. *Federation Proc.*, 1954, **13**, 157. [Dept. Physiol., Univ. Tennessee, Memphis.] Experiments with rats.

4900

MURRAY, M. M. Efectos de la administracion de yodato de sodio al hombre y a los animales. [Effect of giving sodium iodate to man and animals.] *Bol. Ofic. sanit. panamer.*, 1953, **35**, 569-574. [Bedford Coll., Univ. London.] English summary. See Abst. 842, Vol. 24.

4901

VAN MIDDLESWORTH, L., TUTTLE, A. H. and HANEY, D. F. Iodination of milk proteins by iodide. *Federation Proc.*, 1954, **13**, 157. [Dept. Physiol., Univ. Tennessee, Memphis.] Experiments with dogs. See also Absts. 4570, 4649.

IRON AND COPPER

4902

STEWART, W. B. and GAMBINO, S. R. Dynamics of iron absorption. *Federation Proc.*, 1954, **13**, 444. [Dept. Pathol., Columbia Univ., New York.]

4903

GRACE, W. J. and DOIG, R. K. Studies of absorption of iron from the gastro-intestinal tract. *Federation Proc.*, 1954, **13**, 59. [Dept. Med., New York Hosp., Cornell Med. Centre, New York City.] Experiments on man.

4904

STEINKAMP, R., DUBACH, R. and MOORE, C. V. Absorption of radioiron from iron enriched bread. *Federation Proc.*, 1954, **13**, 479. [Dept. Med., Sch. Med., Washington Univ., St. Louis, Mo.] Experiments on man.

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4905

INGALLS, R. and JOHNSTON, F. A. Amount of iron from gastrointestinal sources which was excreted in the feces of human subjects on diets containing small amounts of iron and amount of nitrogen retained from the same diet. *Federation Proc.*, 1954, **13**, 462. [New York State Coll. Home Econ., Cornell Univ., Ithaca.]

4906

HALLGREN, B. Haemoglobin formation and storage iron in protein deficiency. *Acta Soc. Med. upsalien.*, 1954, **59**, 79-208. [Inst. Med. Chem., Univ. Upsala.]

A new method is described for estimation of non-haemin Fe in tissues. Viviperfusion provided a method for total body Hb estimation, since only 2 or 3 per cent. of the total remained in the body of rats after successful perfusion.

A new synthetic diet poor in Fe contained, per cent., spray-dried egg white 18, sucrose 73, poppy-seed oil 5 and iron-free salt mixture 4, with vitamin supplements. Young rats grew better on this diet than on cow's milk and were highly fertile, but developed Fe-deficiency anaemia within 2 months. The Fe content was 2.5 µg. per g. diet.

Four groups of young adult rats were given this diet or the same with protein reduced to 9, 4.5 or 2.25 per cent. and replaced by sucrose, and an adequate Fe supplement. After 47 to 91 days there was a significant fall in Hb concentration in rats on the lowest protein intake. Decrease in total Hb was probably significant on 4.5 and highly significant (38.8 per cent.) on 2.25 per cent. protein diet; total Hb was more affected than Hb concentration. On 4.5 per cent. protein the rats could maintain bodyweight and N balance after adaptation. The fall in total Hb appeared simultaneously with increase in liver fat, fall in liver protein and loss of weight in kidneys and adrenals. Simultaneous deficiency of Fe in growing rats did not increase the effects of protein deficiency, but pregnancy and lactation increased its effects in adult females.

In growing rats receiving 22 per cent. protein, reduction of Fe intake to 70 µg. or less daily produced Fe-deficiency anaemia. The decreases in total Hb and in Hb concentration were about the same. Plasma Fe and storage Fe were low. Adult rats on almost Fe-free diet were able to maintain normal plasma Fe levels for some weeks because of their greater Fe stores. Disappearance of storage Fe from liver and spleen and simultaneous fall in plasma Fe indicate early nutritional Fe deficiency. The amount of storage Fe did not influence Hb formation in protein deficiency.

In protein-depleted rats cortisone or adrenocorticotrophic hormone produced a greater loss of

carcase protein, but prevented loss of total Hb and thus increased Hb concentration and plasma Fe. It is suggested that the decrease of total Hb in relation to carcase protein in protein deficiency is secondary to hormonal adaptation.

Bleeding of protein-depleted rats caused the adrenals to increase in weight.

Non-haemin Fe stores were studied in human subjects at autopsy and in bone marrow fragments obtained by sternal puncture. In 3 men who died from accidental causes the total Fe stored was estimated at about 1 g. In 5 patients with idiopathic hyperchromic anaemia there was no stored Fe.

The literature on Hb formation in protein deficiency and the etiology of idiopathic hyperchromic anaemia are reviewed.—D. Duncan.

4907

PRATT, P. T. and JOHNSON, M. E. **Marrow iron stores in anemia.** *Arch. Int. Med.*, 1954, **93**, 725-730. [Dept. Int. Med., Div. Haematol., Coll. Med., Univ. Nebraska, Omaha.]

Fe stores were estimated qualitatively by staining for haemosiderin with 20 per cent. potassium ferrieyanide and concentrated HCl. In a group of 57 marrow samples from patients with normocytic anaemia and in 11 from patients with macrocytic anaemia Fe stores tended to be high except where there was acute bleeding. In 13 samples of marrow from patients with microcytic anaemia stores were low. In 11 pregnant women they tended to decrease with Hb value. Samples of marrow from 2 patients with *polycythaemia vera* showed low stores; they became normal after treatment which restored Hb to normal. In 20 samples of marrow from patients with diseases other than anaemia, Fe stores were high in 4 and low in 3.—F. C. Aitken.

4908

SATHE, V. and KRISHNAMURTHY, K. **The effect of organic acids on the availability of iron.** *Indian J. Med. Res.*, 1953, **41**, 447-452. [Dept. Biochem., Indian Inst. Sci., Bangalore, 3.]

Rats rendered anaemic on milk diet, with Hb levels about 6 to 7 g. per 100 ml. blood, were divided into 6 groups of 5. Autoclaved soya bean flour was given to 5 groups to provide 0.2 mg. ionisable Fe daily; a control group received ferric chloride. The rest of the diet consisted of dried whole milk supplemented with Cu and Mn, and 3 groups received 64 mg. tartaric acid, 54 mg. ascorbic acid or 60 mg. citric acid daily.

Differences in growth were not significant. All 3 organic acids improved the availability of the Fe in the soya beans, as shown by the rate of Hb regeneration.—D. Duncan.

4909

SATHE, V. and KRISHNAMURTHY, K. **Phytic acid and absorption of iron.** *Indian J. Med. Res.*, 1953, **41**, 453-457. [Dept. Biochem., Indian Inst. Sci., Bangalore 3.]

Rats rendered anaemic by a milk diet received 3 diets containing 75 per cent. rice, unpolished and 7 or 15 per cent. polished, respectively. Fe was supplied as ferric citrate.

Increase in Hb values was most rapid in the group receiving 15 per cent. polished rice and slowest with unpolished rice, and Fe storage was also least in the latter group. It is concluded that phytin P interferes with absorption of Fe.

D. Duncan.

4910

SEEBERG, V. P., HIDALGO, J. and WILKEN, W. **Hemoglobin regeneration following oral administration of chelated iron.** *Science*, 1954, **119**, 608-609. [Res. Div., Cutter Labs., Berkeley, Calif.]

Young rats rendered anaemic by a milk diet received 0.1 mg. Fe daily, in one group as ferrous sulphate and in another as ferric sodium ethylenediamine tetra-acetate. Others received no Fe. All had Cu.

The chelated Fe was as well absorbed and utilised for Hb formation as that from ferrous sulphate. Chelated Fe given intravenously was not well utilised.—D. Duncan.

4911

CARTWRIGHT, G. E., GUBLER, C. J. and WINTROBE, M. M. **Studies on copper metabolism. 11. Copper and iron metabolism in the nephrotic syndrome.** *J. Clin. Invest.*, 1954, **33**, 685-698. [Dept. Med., Coll. Med., Univ. Utah, Salt Lake City.]

For earlier reports see Absts. 4740, 4741, Vol. 23.

In 16 patients aged from 3 to 73 years with the nephrotic syndrome, mean plasma Cu was 64 ± 20 μ g. and plasma Fe 50 ± 33 μ g. per 100 ml. compared with normal means of 116 ± 14 and 110 ± 31 , respectively. In 7 of the patients total Fe-binding capacity was 78, compared with the normal mean of 359 μ g. per 100 ml. Cu and Fe excretion in urine were above normal and were related to protein excretion, though when protein excretion was increased by intravenous injection of albumin Cu and Fe excretion increased only slightly. It is suggested that the low plasma values may be due to loss of ceruloplasmin and transferrin in the urine.—M. B. Richards.

4912

CUMINGS, J. N. **Copper storage in hepatolenticular degeneration and allied diseases.** *Proc. Roy. Soc. Med.*, 1954, **47**, 152-154. [Clin. Pathol.

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Lab., Inst. Neurol., National Hosp., Queen Sq., London, W.C.1.]

Data are given for urinary excretion of Cu and amino-acids in 34 patients with different disorders. In 3 patients with hepatolenticular degeneration, with typical clinical signs and showing a Kayser Fleischer ring, the urinary excretion of Cu and of amino-acids was far in excess of normal. Examination of brain tissue from 4 patients showed that only with hepatolenticular degeneration was there any retention of Cu in the tissues. Other patients with a somewhat similar clinical picture, but without a Kayser Fleischer ring, showed no biochemical abnormality in the urine. No patient with any disease other than hepatolenticular degeneration has yet been found to have a high urinary excretion of Cu (cf. Abst. 933, Vol. 22).—M. B. Richards.

See also Absts. 4774, 5232.

OTHER MINERALS

4913

DĄBROWSKA, W., ŻEBROWSKI, L., LEZIAK, K. and BŁOŃSKA, J. Szybkość reakcji krwiotwórczej na podawanie kobaltu u kurcząt. [The effect of cobalt on the hemopoietic reactions.] *Rocz. Nauk rol.* [B], 1954, **67**, 257–268. Russian and English summaries.

Polish greenleg chickens were given, by mouth, 0.8 µg. Co per 100 g. bodyweight daily. Haemopoiesis was stimulated as early as 14 hr. after the start of treatment but in 2 weeks activity tended to return to normal. Withdrawal of the Co was followed by a fall in erythropoiesis 60 hr. later. Chickens given Co showed a growth response, but there was none if they had previously been treated with the antiseptic quinosol. It is concluded that Co has a direct effect on the erythropoietic system, but that on the microflora reduced by quinosol it had no effect beneficial to the chickens.

D. Harvey.

4914

BURNS, M. J. and SALMON, W. D. Effect of cobalt on growth of chicks and rats. *Federation Proc.*, 1954, **13**, 452. [Dept. Animal Husb. Nutrit., Alabama Polytech. Inst., Auburn.]

4915

DE RENZO, E. C., HEYTLER, P. G. and KALEITA, E. Further evidence that molybdenum is a co-factor of xanthine oxidase. *Arch. Biochem. Biophys.*, 1954, **49**, 242–244. [Chem. Biol. Res. Sect., Lederle Labs. Div., American Cyanamid Company, Pearl River, N.Y.]

In rats made deficient in xanthine oxidase as described in Abst. 856, Vol. 24, subcutaneous injection of molybdenum produced rapid formation of the enzyme.

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When partly purified xanthine oxidase prepared from cream was dialysed against ammonia solution, the supernatant had coenzyme activity proportional to the amount of Mo present. The apoenzyme could be partly activated by addition of Mo as sodium molybdate, but not by glutathione, cyanide or other reducing agents.—D. Duncan.

4916

DUNLOP, G. Trace elements and nutrition. 1. Molybdenum. *Agriculture, J. Minist. Agric. Engl.*, 1954, **61**, 55–59.

4917

VAN REEN, R. and PEARSON, P. B. Biochemical abnormalities during molybdenum toxicity in rats. *Federation Proc.*, 1954, **13**, 314. [McCollum-Pratt Inst., Johns Hopkins Univ., Baltimore, Md.]

4918

DZIEWIATKOWSKI, D. D. Effect of age on some aspects of sulfate metabolism in the rat. *J. Exp. Med.*, 1954, **99**, 283–298. [Hosp. Rockefeller Inst. Med. Res.]

Rats aged 10, 30 or 300 days received intraperitoneal injections of 0.3 µC. ³⁵S as Na₂SO₄ per g. bodyweight and were killed by bleeding after 12, 24, 48 or 96 hr. The concentration of ³⁵S in the pooled sera of 10-day-old rats was 3 to 5 times as high as those in the sera of 30- or 300-day rats, which were similar. A much greater proportion of the ³⁵S in the sera was dialysable in the youngest rats than in the others. A substantial proportion of the ³⁵S in the sera was bound to protein, the non-dialysable ³⁵S being associated mainly with the albumin component.

Mucopolysaccharides were isolated from the skeletons, pelts and viscera of the animals and the specific activity of the sulphate S prepared from them was measured. The highest specific activity was in mucopolysaccharides from the tissues of the youngest rats and the lowest in those from the oldest. The highest activities were obtained from rats slaughtered 12 hr. after injection and there was a slow drop in specific activity as the interval before slaughter was extended to 96 hr.

Estimation of ³⁵S in the ends and shafts of femurs and radio-autographs of the long bones support the view that the ³⁵S had been incorporated into the chondroitin sulphate of growing cartilage (Abst. 2531, Vol. 22).—W. Godden.

4919

DZIEWIATKOWSKI, D. D. Utilization of sulfate sulfur in the rat for the synthesis of cystine. *J. Biol. Chem.*, 1954, **207**, 181–186. [Hosp. Rockefeller Inst. Med. Res., New York.]



Two groups of rats were 10 days and 2 groups were 32 days old. Fourteen young and 7 older rats received a single intraperitoneal injection of carrier-free ^{35}S as sodium sulphate in water, 1 μC . per g. bodyweight. The other 2 groups received 2 such injections with an interval of 24 hr. All were killed 24 hr. after injection. The skin with hair, the internal organs, and the skeleton with musculature from the rats in each group were pooled and cystine was isolated from each sample.

^{35}S was present in all the cystine samples, and with one exception the double injection produced about twice as much isotope per mg. cystine S as did the single injection. The amount of ^{35}S in the samples was small, a millimole of the cystine sample with the highest ^{35}S content representing only about 0.02 per cent. of the ^{35}S given.

There was more ^{35}S in the skin, skeleton and muscle samples from the young than from the older rats, but the latter had more ^{35}S in the internal organs.—D. Duncan.

4920

DAVIES, D. V. and YOUNG, L. **The distribution of radio-active sulphur (^{35}S) in the fibrous tissue, cartilages and bones of the rat following its administration in the form of inorganic sulphate.** *J. Anat.*, 1954, **88**, 174–183. [St. Thomas's Hosp. Med. Sch., London.]

After intraperitoneal injection of rats with ^{35}S -labelled Na_2SO_4 there was an appreciable uptake of ^{35}S in all cartilages, but less in fibrous than in hyaline and less in white than in elastic fibro-cartilage. In epiphyseal cartilage the maximum concentration occurred in the zone of the cell columns. Both in 2-day-old and 3-week-old rats the ^{35}S was widely distributed through the tissues 4 hr. after injection, but by the tenth day it had disappeared from the fibrous tissues and from most cartilages except from the cell column zone.

In all cartilages, and more particularly in the cell column zone, much of the ^{35}S within 4 hr. was not merely held as inorganic Na_2SO_4 , but was fixed in the tissues in a form insoluble either in water or in buffer solution at pH 10. It is suggested that the inorganic sulphate had been incorporated in a component of the cartilaginous matrix.

M. B. Richards.

4921

BÉLANGER, L. F. **Autoradiographic visualization of the entry and transit of S^{35} in cartilage, bone, and dentine of young rats and the effect of hyaluronidase *in vitro*.** *Canad. J. Biochem. Physiol.*, 1954, **32**, 161–169. [Dept. Histol., Sch. Med., Univ. Ottawa, Ont.]

The distribution of ^{35}S in skeletal tissues was studied in suckling rats from 1 hr. to 6 days after a single injection of labelled sulphate.

^{35}S diffused rapidly into cartilage and was incorporated into an organic molecule, probably chondroitin sulphate, in the 48 hr. after injection. By the sixth day the ^{35}S had left the cellular elements and was in the matrix.

In bone and dentine the deposition of ^{35}S in the first few hours was apparently proportional to the degree of mineralisation, and it was removed by demineralisation. After demineralisation a thin band of radio-activity persisted along a growth line, probably again associated with chondroitin sulphate.—D. Duncan.

4922

ZIRM, K. L., KILCHES, R. and SCHREINER, H. **Über das biologische Verhalten von Metall-derivaten des Chlorophyllins. 1. Untersuchungen zur Ausscheidung von Zink-Chlorophyllin unter Anwendung von $\text{Zn } 65$. [Biological behaviour of metal derivatives of chlorophyllin. 1. Studies of the excretion of zinc chlorophyllin with ^{65}Zn .]** *Biochem. Ztschr.*, 1954, **325**, 163–169. [Lannacher Heilmittel Gesellsch., Lannach, Styria.]

When mice were injected subcutaneously with $^{65}\text{ZnCl}_2$ the Zn was very rapidly excreted, and after 60 hr. could no longer be detected in any of the organs except the intestines. After injection of ^{65}Zn -chlorophyllin-Na solution, mobilisation from the injection depot and excretion of the protein complex formed, which accumulated in the lymph nodes before transport to the blood, were very much slower. Activities were still measurable after 3000 hr. Both for ZnCl_2 and the Zn-chlorophyllin compound excretion was almost entirely through the intestines. The path of excretion of chlorophyllin derivatives is determined by the metal atom, for Co-chlorophyllin, as was previously shown (Abst. 3282, Vol. 23), is excreted almost entirely through the kidneys.—M. B. Richards.

4923

MACHLIN, L. J., JACKSON, J. T., LANKENAU, A. H. and PEARSON, P. B. **Uptake of S^{35} in the feathers, gizzard lining, liver and muscle of young chickens after injection with radio-active methionine or sulfate.** *Poultry Sci.*, 1954, **33**, 234–238. [Bur. Animal Indust., U.S. Dept. Agric., Beltsville, Md.]

Chickens aged 3 weeks received a single intramuscular injection of 21 μC . L-methionine and were killed from 4 hr. to 36 days later. In a second experiment birds 4 weeks old received on 3 consecutive days injections of labelled methionine or sodium sulphate.

Muscle retained ^{35}S much longer than did gizzard lining or liver. Since the gizzard lining does not contain living cells, its loss of radio-activity prob-

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ably represented the rate at which the tissue wears away; if so, half the lining is worn away every 5 to 10 days in young chickens. The gizzard lining had a high content of cystine and methionine.

Both methionine and sulphate provided ^{35}S for incorporation into cystine, as was shown by its recovery from feathers. Once deposited in the feathers the ^{35}S was not exchanged with body S, and ^{35}S from methionine injected into adult hens did not appear in the feathers. Growth was shown to take place only from the base of the feather.—D. Duncan.

4924

TRIBBLE, H. M. and SCOLAR, F. I. **Zinc metabolism of young college women on self-selected diets.** *J. Nutrition*, 1954, **52**, 209–216. [Sch. Home Econ., N. Texas State Coll., Denton.]

Zinc balances were estimated in 13 subjects aged from 17 to 27 years, for 5 days on self-selected diets.

Intake varied from 9.8 to 14.4 mg. Zn daily. Mean excretion of Zn in urine and faeces was 8 and 42 per cent., respectively, of the intake. All the subjects were in positive balance and retained on the average 6.6 mg. daily.—R. Hill.

4925

DAUM, S. **Metabolismus zinku.** [Metabolism of zinc.] *Čas. Lék. čes.*, 1954, **93**, 171–173. [2. Int. Clin., Karl's Univ., Prague.] Russian summary.

4926

TUPPER, R., WATTS, R. W. E. and WORMALL, A. **The incorporation of ^{65}Zn into avian eggs.** *Biochem. J.*, 1954, **57**, 245–255. [Dept. Biochem., Med. Coll., St. Bartholomew's Hosp., London, E.C.1.]

Five hens were kept in battery cages and fed on stock chicken pellets, which with the grit and water provided a total Zn intake of about 5.7 mg. per bird daily. The mean total Zn content of their eggs was $310\ \mu\text{g.}$, S.E. ± 26 in the yolks with only traces in the whites and shells. The birds received intramuscular injections of a zinc-glycine complex containing ^{65}Zn ; the preparation of the complex is described.

^{65}Zn appeared in the yolks of eggs laid after the injections, but not in whites or shells. After a single injection the hens stopped laying for 3 to 7 days, except for one which laid an egg 18 hr. after injection; this egg contained no ^{65}Zn . The highest activity, representing 1.5 to 2.0 per cent. of the injected ^{65}Zn , was in eggs laid 5 to 10 days after the injection; activity then fell quite sharply until the fourteenth day, and subsequently declined slowly. The eggs of one hen were examined for 37 days after the injection, and the last one laid contained 0.5 per cent. of the injected ^{65}Zn ; the total ^{65}Zn content of the eggs in this time was 20 per cent. of that injected. All the ^{65}Zn was precipitated with the protein and especially with lipovitellin; none was bound to livetin, phosphovitin or yolk lipids. The ^{65}Zn was firmly bound to the vitellin component and could not be removed by dialysis or exchanged with that of non-radio-active zinc-glycine.—D. Duncan.

See also Abst. 4959.

ACID BASE EQUILIBRIUM

4927

KÖHN, K. **Lymphgewebe und Milz im Tierversuch bei saurer und basischer Nahrung, bei Hunger und Hormonbehandlung.** [Lymphatic tissue and spleen in animals on acid or basic diets, starved animals and animals treated with hormones.] *Frankfurter Ztschr. Pathol.*, 1954, **65**, 5–21. [Pathol. Inst., Städt. Krankenhaus, Berlin-Spandau.]

Experiments were made on 150 guineapigs and 15 cats to test the effect of acid or basic diets, hunger, or hormone treatment on lymph tissue and spleen. The tissues were examined histologically, and observations were made of urine reaction, alkali reserve, weight of body and spleen, and circulating lymphocyte count. The experiments showed that acid or alkali diet alone caused no change in the alkali reserve or in the blood picture. By giving NH_4Cl or NaHCO_3 by mouth, or intracardially, acidosis or alkalosis was produced, with

leucocytosis or leucopenia. Histologically no influence of acid or basic diet was found on spleen or lymph tissue. Guineapigs on acid and cats on basic diets, in which appetite was poor, showed loss of weight in spleen and lymph tissue similar to the atrophy of these tissues from starved animals. In animals treated with cortisone or ACTH there was pronounced lymphopenia, with hyperplasia of reticuloendothelial tissue, but no definite centre of proliferation was found in the lymph follicle as described by Hoepke, whose work is critically reviewed in the introduction of the paper. An extensive bibliography is included.

M. B. Richards.

4928

DALE, H. E., GOBERDHAN, C. K. and BRODY, S. **A comparison of the effects of starvation and thermal stress on the acid-base balance of dairy cattle.** *Amer. J. Vet. Res.*, 1954, **15**,

197-201. [Dept. Vet. Physiol., Grad. Sch., Univ. Missouri, Columbia.]

Four cows, 2 in milk, were kept at a temperature of 60° to 70° F. and relative humidity 60 to 80 per cent. and were fed on a standard dairy ration for 6 days before being allowed only salt and water for 5 days.

Plasma concentrations of cations fell slightly during starvation, from a mean total of 177.8 to 168.2 m. equiv. per litre, but urinary output of cations fell from 4635.0 m. equiv. daily to 805.9,

showing the homeostatic power of the kidney. Total anions in plasma fell from 47.1 to 43.2 m. equiv. per litre and excretion from 5513.2 to 1691.0 m. equiv. daily. Carbonate excretion fell from 4500 to 540 m. equiv., and phosphate excretion rose from 4.2 to 824.0 m. equiv. daily. Blood *pH* and bicarbonate content remained constant. Ketone bodies in blood and urine rose sharply, in dry as in lactating cows, and excretion of organic acids declined.—D. Duncan.

See also Absts. 4315, 4541.

METABOLISM OF WATER

4929

MANERY, J. F. **Water and electrolyte metabolism.**

Physiol. Rev., 1954, **34**, 334-417. [Dept. Biochem., Fac. Med., Univ. Toronto, Ont.]

4930

MCCANCE, R. A., NAYLOR, N. J. B. and WIDDOWSON, E. M. **The response of infants to a large dose of water.** *Arch. Dis. Childhood*, 1954, **29**, 104-109. [Dept. Exp. Med., Med. Res. Council, Univ. Cambridge.]

Ten normal babies, aged from 6 to 18 days, and 7 adults were given a test dose of water equal to 5 per cent. of bodyweight or 6 per cent. of body water. The test dose led to a great and rapid increase in urine flow. The flow subsided more quickly in infants than in adults, but on the basis of body water the minute volumes attained were the same. At the height of diuresis the concentrations of Na, Cl and K in the infants' urines were the same as in the adults' urines.—F. C. Aitken.

4931

KENNEY, R. A. **The effect of the drinking pattern on water economy in hot, humid environments.**

Brit. J. Indust. Med., 1954, **11**, 38-39. [Lab. Hot Climate Physiol. Res., Oshodi, Lagos, Nigeria.]

Six members of the Lagos labour force exercised in a chamber at a temperature of 100° F. dry bulb and 95° F. wet bulb by stepping on and off a stool 12 in. high 20 times per min. for 5 min. in each of 6 successive quarters of an hour. Each test of 90 min. was made once a week or less often. The air was in motion. The men were dried with a towel and weighed with the bladder empty before and after each test. The volume of urine passed after the 90 min. was measured. When no water was drunk during the test the men lost about 1 kg., so 1 litre was the amount of water selected to be drunk during the test. In different tests it was taken all at once just before the test or in equal fractions equally spaced 3, 6 or 9 times in the 90 min. The loss in the urine was less the smaller the interval, but in all the tests except the last one

in which 83 ml. were taken every 7½ min. more water was lost through the urine than when no water was taken at all. The non-urinary loss did not differ significantly in any of the tests. The most economical way to use a limited supply of water is, therefore, to drink small amounts frequently.

E. M. Hume.

4932

TAYLOR, W. H. **Water diuresis in idiopathic steatorrhoea.** *Clin. Sci.*, 1954, **13**, 239-245. [Dept. Biochem. (Radcliffe Infirmary), Univ. Oxford.]

The diuresis after a litre of water was estimated under strictly controlled conditions which included the taking of breakfast before the water. Trials showed that in 18 patients with active idiopathic steatorrhoea diuresis was less than in normal subjects, owing to a significant delay in the time taken to reach maximum flow and to a reduction in the maximum rate of excretion. There was some overlapping of the values in the 2 series of subjects.

In 5 patients in remission diuresis was normal. In the patients with the active condition there was a significant positive correlation of the 2-hourly urine volume with the percentage fat absorption, but not with Hb level or the duration of the illness. In 18 patients with idiopathic hypochromic anaemia and in 31 patients with pernicious anaemia the results of the test were similar to those found in idiopathic steatorrhoea. The test was normal in 2 out of 4 patients with pancreatic steatorrhoea. In chronic diarrhoea of unknown origin water diuresis was found to be normal in patients without steatorrhoea but decreased in patients with steatorrhoea. These results confirm the hypothesis of Wollaeger and Scribner, which states that water is held in the intestine during prolonged digestion and absorption of food. It is suggested that this test might be useful and time-saving in assessing progress in patients with idiopathic steatorrhoea.—L. Wills.

4933

CHAKRAVARTY, N. K., CHAKRAVARTI, H. S., DUTTA, B. N. and CHAUDHURI, R. N. **Body-fluid changes in epidemic dropsy.** *Indian J. Med.*

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Res., 1953, **41**, 307-309. [Clin. Res. Unit, Indian Counc. Med. Res., Sch. Trop. Med., Calcutta.]

During an outbreak in 1950 in Calcutta body fluid changes in 12 patients with epidemic dropsy were studied and compared with normal values (see Abst. 122, Vol. 23). The means, with normals in brackets, were: plasma volume 2152 (1591), blood volume 2999 (2770), red blood cell mass 857 (1179), available thiocyanate space 10,304 (7401), and interstitial fluid 7489 (5212) ml. per sq. m. body surface. Progressive changes for 3 patients are illustrated. The anaemia accompanying the disease is concluded to be the result not of blood dilution but of actual reduction in the number of circulating red cells.—D. Harvey.

4934

WYNN, V. and ROB, C. G. **Water intoxication. Differential diagnosis of the hypotonic syn-**

dromes. *Lancet*, 1954, **266**, 587-594. [St. Mary's Hosp. Med. Sch., London.]

4935

TRÉMOLIÈRES, J. Données élémentaires sur la physiologie de l'eau du sodium et du potassium. Implications cliniques. [Fundamental data on the physiology of water, sodium and potassium. Clinical implications.] *Diététique et Nutrition*, 1954, **5**, 7-17. [Groupe d'Études Métabol., Sect. Nutrit., Inst. Nat. Hyg., Paris.]

4936

FISHER, R. B. **The absorption of water and of some non-electrolytes from the surviving small intestine of the rat.** *J. Physiol.*, 1954, **124**, 21P-22P. [Dept. Biochem., Univ. Oxford.]

See also Abst. 4160.

METABOLISM OF OTHER SUBSTANCES

4937

CAFFARENA, G. and MERLINI, M. Rapporti tra piruvicemia materna e fetale alla nascita. [Relation between the blood pyruvic acid values of mother and child at birth.] *Lattante*, 1953, **24**, 517-520. [Ist. Clin. Pediat. G. Gaslini, Univ. Genoa.] English summary.

Pyruvic acid was estimated in the blood of 9 women as soon as possible after parturition, and in the blood of their newborn infants. The values were high; in mg. per 100 ml. they ranged for the infants from 1.15 to 1.86 and for the mothers from 1.69 to 3.43. The values for the infants were below those for the mothers and roughly followed them. The highest values obtained, 3.15 and 3.91, were for a tenth woman with severe albuminuria and her child, respectively. The other values had some direct relation to the duration of labour.

E. M. Hume.

4938

McCORMICK, M. H., HARRIS, P. N. and ANDERSON, C. A. **The role of myo-inositol in purified diets.** *J. Nutrition*, 1954, **52**, 337-344. [Lilly Res. Labs., Indianapolis, Ind.]

In a 16 weeks' growth test on young white rats of the Harlan strain addition of 10 mg. inositol to 100 g. of a diet of purified amino-acids, oil, salts, purified vitamins and sucrose had no significant effect on average weight gain or protein efficiency. There was no significant difference in average weight gain between the 2 groups of rats on the basic amino-acid diet and a group which received 19 per cent. casein instead of the amino-acids. The inositol content of the carcasses was similar in all 3 groups with little variation in the individual values; it apparently does not depend on the

intake of inositol. Gross and microscopic examination of the animals and tissues did not show any difference between the 2 groups on the basic diet.—M. B. Richards.

4939

ARENDS, A. and NIEWEG, H. O. **Nutritional factors in renal disease in infancy.** *Lancet*, 1954, **266**, 647-649. [Pathol. Lab., Univ. Groningen.]

Two cases of associated renal and liver lesions are described in which the morphological pictures resembled acute and chronic choline deficiency in rats.—F. C. Aitken.

4940

HOVE, E. L. and COPELAND, D. H. **Muscular dystrophy in rabbits as a result of chronic choline deficiency.** *Federation Proc.*, 1954, **13**, 461. [Dept. Animal Husb. Nutrit., Alabama Polytech. Inst., Auburn.]

4941

HARTROFT, W. S. and BUCKLEY, G. F. **Dietary choline and the cardiovascular system of rats.** *Federation Proc.*, 1954, **13**, 430-431. [Banting and Best Dept. Med. Res., Univ. Toronto.]

4942

REID, M. E. **Choline studies with the young guinea pig.** *Federation Proc.*, 1954, **13**, 474. [Nat. Insts. Health, Bethesda, Md.]

4943

SCHMIDTKE-RUHNAU, D. Die Beeinflussung der Leberdurchblutung durch "lipotrope" Stoffe.

[Effect of "lipotropic" substances on blood flow through the liver.] *Arch. exp. Pathol. Pharmacol.*, 1954, **222**, 247-249. *Proc. [Hanover.]*

4944

GOOSSEN, E. and OKEY, R. High vegetable fat diet on oxidation of acetate-2-C¹⁴ in the intact

rat. *Federation Proc.*, 1954, **13**, 219. [Dept. Home Econ., Univ. California, Berkeley.]

4945

FLEISCH, A. and WENNER, V. Les effets physiologiques du café et des extraits de café. [Physiological effects of coffee and coffee extracts.] *Schweiz. med. Wochenschr.*, 1954, **84**, 223-226. [Inst. Physiol., Univ. Lausanne.]

METABOLISM OF CELLS, TISSUES, ETC.

GENERAL PHYSIOLOGY

4946

SUTHERLAND, D. A., MCCALL, M. S., GROVES, M. T. and MUIRHEAD, E. E. Survival of human erythrocytes tagged with radioactive chromium: a method yielding results comparable to the Ashby technic. *Amer. J. Med.*, 1954, **16**, 611. *Proc. [Radioisotope Unit, Veterans Admin. Hosp., Dallas, Tex.]*

4947

MATTHIES, H. Über Stoffwechselleistungen von roten Blutkörperchen. 1. Kationentransport und Methämoglobinrückbildung. [The work of the red blood cells. 1. Transport of cations and reversion of methaemoglobin.] *Arch. exp. Pathol. Pharmacol.*, 1954, **221**, 497-505. [Inst. Pharmacol., Humboldt Univ., Berlin.]

Studies were made of the relation between the active transport of cations and the reversion of methaemoglobin in red blood cells, mainly of rabbits. It was shown that glucose supports both processes, precedence going to the reversion under normal osmotic conditions. If the red cells lose the power to reduce methaemoglobin, the maintenance of the osmotic condition of the cells is no longer assured. Lactate supports only the reversion process. Simultaneous addition of glucose and lactate supports both methaemoglobin reduction and cation transport. In hypertonic disease methaemoglobin reversion is distinctly retarded, through causes not yet explained. Differences in the osmotic behaviour of normal red cells and those containing methaemoglobin may indicate that methaemoglobin reduction is connected with a reduction of osmotic resistance.—M. B. Richards.

4948

WHITNEY, J. E. and ROBERTS, S. Influence of previous diet on the synthesis of glycogen, fatty acids, and cholesterol by rat liver in vitro. *Federation Proc.*, 1954, **13**, 320. [Dept. Physiol. Chem., Sch. Med., Univ. California, Los Angeles.]

4949

KERLY, M. and OTTAWAY, J. H. The effect of diet on glycogen formation in rat liver. *J. Physiol.*,

1954, **123**, 516-533. [Dept. Biochem., University Coll., London.]

Rats were fed from weaning on diets rich in carbohydrate, fat or protein and some were fasted for 24 or 48 hr. before they were killed. The glycogen content of the liver was affected by the sex of the rat and by the composition of the diet, in both fed and fasted animals. The proportion of the total glycogen extractable by 10 per cent. trichloroacetic acid was highest on the high-fat and lowest on the high-protein diet. Changes in the glycogen content of liver slices during incubation depended on the initial glycogen content. Diet affected the amount of glycogen synthesised during incubation in a glucose-containing medium, but not when glucose-1-phosphate or pyruvate was the substrate.—M. B. Richards.

4950

KERLY, M. and OTTAWAY, J. H. The effect of diet on the metabolism of glucose and of acetate by rat diaphragm muscle. *J. Physiol.*, 1954, **123**, 534-552. [Dept. Biochem., University Coll., London.]

Diaphragm muscle was taken from rats reared since weaning on diets high in carbohydrate, fat or protein and measurements were made of glycogen content, rates of uptake of glucose and acetate, oxygen consumption and lactate production during its incubation in media containing glucose or acetate, with or without added insulin.

Diet affected particularly the metabolism of recently fed rats, and fasting affected the rates of all the metabolic changes studied. Insulin significantly increased glucose uptake, glycogen formation from glucose, and oxygen consumption in presence of glucose. Muscle from female rats stored more glucose as glycogen, oxidised less glucose, and utilised more acetate, and the oxygen consumption with glucose as substrate was significantly less than in male muscle. Since there was no formation of glycogen from acetate, it was deduced that acetate could not completely replace endogenous fat as a substrate for oxidation.

M. B. Richards.

4951

BÜHLER, M. Versuche zum Glykogenaufbau am überlebenden Mäusezwerchfell. [Studies of

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glycogen hydrolysis in the surviving mouse diaphragm.] *Arch. exp. Pathol. Pharmacol.*, 1954, **222**, 240-241. *Proc.* [Tübingen.]

4952

BING, R. J., SIEGEL, A., UNGAR, I. and GILBERT, M. **Metabolism of the human heart. 2. Studies on fat, ketone and amino acid metabolism.** *Amer. J. Med.*, 1954, **16**, 504-515. [Dept. Med., Med. Coll. Alabama, Birmingham.]

For part 1 see Abst. 2166, Vol. 24.

Uptake by the heart of fatty acids, ketone bodies and amino-acids was studied, by the method previously described, in 33 patients, none of whom was in cardiac failure.

At blood fatty acid levels of 0.605 to 1.76 m. equiv. per cent., mean 1.105, S.D. 0.286, extraction of fatty acids ranged from 0 to 0.043 m. equiv. per cent., mean 0.016 ± 0.013 . In 8 patients studied 3 to 4 hr. after a meal of fat the heart took up 0.013 to 0.07, mean 0.028 ± 0.02 m. equiv. per cent. of fatty acids, which suggests storage of fat.

There was a negative correlation between utilisation of carbohydrate and ketone bodies.

Extraction of amino-acids from coronary blood ranged from 0 to 0.45, mean 0.132 ± 0.167 mg. per cent. of N, and the oxygen extraction ratios suggested that a considerable fraction of the oxygen consumption of the heart could be ascribed to amino-acid breakdown. When amino-acids were infused intravenously in 6 patients the 245 per cent. increase in myocardial amino-acid extraction was out of proportion to the 20 per cent. rise in blood amino-acid level. There was also a significant rise in glucose extraction.

Reasons are discussed for the large scatter shown in statistical analysis of the results. It is concluded that the heart is "geared" to the general metabolic state of the body.—D. Duncan.

4953

TENG, C. T. **Studies on carbohydrate metabolism in rat kidney slices. 1. Metabolism of glycerol and pyruvate. 2. Effect of alloxan diabetes and insulin administration on glucose uptake and glucose formation.** *Arch. Biochem. Biophys.*, 1954, **48**, 409-414; 415-423. [Dept. Physiol., Baylor Univ. Coll. Med., Houston, Tex.]

4954

FONNESU, A. Consumo di ossigeno e ossidazione degli acidi grassi inferiori nel rene in rigonfiamento torbido sperimentale. [Oxygen consumption and oxidation of lower fatty acids in the kidney in experimental cloudy swelling.] *Arch. Sci. biol., Bologna*, 1954, **38**, 1-14. [Ist. Patol. Gen., Univ. Perugia.]

Cloudy swelling was induced in the kidneys by

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bacterial toxins, injection with HgCl_2 or ligation of the renal peduncle in rats and guineapigs. In each type of cloudy swelling considered, the oxygen consumption was distinctly diminished and the oxidation of butyric, valeric and crotonic acids was reduced, but β -hydroxybutyric acid was oxidised normally. The metabolic changes were compared with the histological changes in mitochondrial structure.—M. B. Richards.

4955

KLEIN, P. D. and JOHNSON, R. M. **A study of the onset of unsaturated fatty acid deficiency in subcellular particles of rat livers.** *Arch. Biochem. Biophys.*, 1954, **48**, 380-385. [Detroit Inst. Cancer Res.]

Male rats weaned at 18 days of age were given a diet containing glucose 77, casein 18, salts 4 and vitamin mixture 1 per cent. Control animals received the same diet except that 5 per cent. maize oil was incorporated at the expense of glucose. At fortnightly intervals pairs of rats were killed and their liver tissue was fractionated into large granules, microsomes and a poorly sedimentable fraction. Lipids were extracted from each fraction and analysed for di-, tri-, tetra- and pentaenoic fatty acids.

On the fat-free diet, the di-, tetra- and pentaenoic acid content of liver cytoplasmic particles declined rapidly. The rate of decline became slow after about 6 weeks. The greatest losses were from the microsomes and the least from the mitochondria. Trienoic acid accumulated in all 3 fractions to reach 4 to 6 times the amount found in liver particles from rats on the control diet.

It is suggested that the primary changes in essential fatty acid deficiency in the rat may take place about 6 weeks before overt clinical signs appear.—G. A. Garton.

4956

LYON, I. and GEYER, R. P. **Fatty acid metabolism and hepatic lipogenesis.** *Federation Proc.*, 1954, **13**, 466. [Dept. Nutrit., Harvard Sch. Pub. Health, Boston, Mass.]

4957

CHERNICK, S. S., RODNAN, G. P. and SCHWARZ, K. **Metabolic lesions in dietary necrotic liver degeneration.** *Federation Proc.*, 1954, **13**, 191. [Nat. Insts. Health, Bethesda, Md.]

Experiments with rats.

4958

LASKIN, D. M. and ENGEL, M. B. **Metabolism of bone in rabbit under the influence of parathyroid extract.** *Federation Proc.*, 1954, **13**, 521. [Univ. Illinois Coll. Dent., Chicago.]

See also Absts. 4405, 4406, 4818.

GROWTH AND METABOLISM OF TUMOUR CELLS

4959

HEATH, J. C. Cobalt as a carcinogen. *Nature*, 1954, **173**, 822-823. [Strangeways Res. Lab., Wort's Causeway, Cambridge.]

By a non-lethal disturbance of normal mitosis in chick fibroblasts produced *in vitro* by CoCl_2 , some cells became mononucleate and retained one large cytoplasmic nucleolus or more. Experiments were made *in vivo* in which Co powder mixed with fowl serum was injected into thigh muscles of 10 male and 10 female rats and the same numbers of animals as controls were given fowl serum only. After $7\frac{1}{2}$ months 2 males and 1 female in the experimental group had developed malignant neoplasms and 2 females had tiny nodules at the site of injection. A few of the mitotic cells in the tumours showed persistent nucleoli.

Study of the connection between the neoplastic process and the cytological effects *in vitro* is being extended.—D. Harvey.

4960

MILLER, O. J. and GARDNER, W. U. The role of thyroid function and food intake in experimental ovarian tumorigenesis in mice. *Cancer Res.*, 1954, **14**, 220-226. [Dept. Anat., Sch. Med., Yale Univ., New Haven, Conn.]

Ovarian transplants were grafted into the spleens of 109 castrated F_1 hybrid mice at 37 to 71 days of age. Of these mice, 24 controls were fed on fox chow with meat meal (Purina), 24 were rendered hyperthyroid by addition of 0.2 per cent. dried thyroid to this diet and 24 were rendered hypothyroid by addition of 0.2 per cent. thiouracil.

Inanition was induced in 37 mice by restricting the food to two-thirds of the control intake; 16 of these were fed to appetite after $4\frac{1}{2}$ to $7\frac{1}{2}$ months of restriction. The mice were killed 11 to 29 months after the experiment was begun, for histological examination of the graft, metastases, liver, adrenals, kidneys, thyroids and genital organs.

Ovarian tumours were found in 16 of 21 mice on the control diet, 3 of 20 given dried thyroid, 10 of 21 given thiouracil, 5 of 12 underfed and 12 of 14 re-fed mice. In 8 mice there was no sign of the ovarian graft. One tumour of a type previously undescribed and one tubular adenoma occurred in hyperthyroid females, but the total incidence of ovarian tumours in the thyroid-fed mice was significantly less than in any other group. Adrenal cortical hyperplasia was most extensive in the control and re-fed groups. Oestrogenic hormone and progesterone were produced in quantities sufficient to cause changes in the uterus of the tumour-bearing mice in all except the underfed group. Hepatomas occurred in 6 hypothyroid mice, 5 of which failed to develop ovarian tumours, and in none of these was oestrogenic hormone produced. Scrotal hernias occurred in 4 castrated males with tumours, one control and 3 in the re-fed group.—B. W. Simpson.

4961

JARDETZKY, O., VISSCHER, M. B. and KING, J. T. Effect of fractionation of dietary fat on the incidence of hepatomas in C_3H male mice. *Proc. Amer. Soc. Cancer Res.*, 1954, **1**, 22-23. [Dept. Physiol., Univ. Minnesota, Minneapolis.]

See also Absts. 4381, 4522.

METABOLISM OF GROWTH, REPRODUCTION AND SENESCENCE

GROWTH

4962

KELLY, H. J., SLOAN, R. E., HOFFMAN, W. and SAUNDERS, C. Accumulation of nitrogen and six minerals in the human fetus during gestation. *Human Biol.*, 1951, **23**, 61-74. [Res. Lab., Child. Fund Mich., Detroit.]

Data are tabulated for the N, Ca, Mg, K, Na, P and Cl in human foetuses as given in 11 papers which give also the crown-heel length of the foetuses. The formula of Scammon and Calkins was used to compute menstrual age in lunar months from crown-heel length. Second degree equations are given which relate Mg, Cl, K, P and Na to age, an orthogonal polynomial formula for Ca and a linear equation which relates N in g. per kg. bodyweight to age.—I. Leitch.

4963

ELKJÆR-LAURSEN, E. and FLAMAND-CHRISTENSEN, J. Investigation into the growth and develop-

ment of premature infants in the town of Esbjerg. *Acta paediat.*, 1954, **43**, 207-208 (with discussion 208). *Proc.*

4964

CAWLEY, R. H., MCKEOWN, T. and RECORD, R. G. Influence of the pre-natal environment on post-natal growth. *Brit. J. Prev. Social Med.*, 1954, **8**, 66-69. [Dept. Social Med., Univ. Birmingham.]

The weight and length of 334 boys and 307 girls were recorded at birth and at 3, 6, 9, 12 and 24 months of age.

Positive correlations were found at birth between weight and length on the one hand and duration of gestation and birth rank on the other. These had disappeared by 2 years of age. There was little correlation between weight and length on the one hand and maternal age on the other until 2 years of age, when a positive correlation was obtained.—F. C. Aitken.

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4965

DEL MUNDO, F. and CRUZ-ADIAO, A. **Measurements of 10,839 newborn Filipino babies (a follow-up study).** *J. Philippine Med. Assoc.*, 1953, **29**, 505-508. [The Little Clinic, Q.C.]

The study previously reported (Abst. 2058, Vol. 23) was extended to over 10,000 newborn infants from government, charity and private hospitals. The infants in private hospitals were again slightly heavier than those in other hospitals. There was no significant difference in height or in head or chest circumference from those of the first study.—A. M. Copping.

4966

THOMPSON, J. **Birth weight and weight gain at six months.** *Health Bull., Dept. Health Scot.*, 1954, **12**, 25-28.

Healthy single infants, 175 male and 163 female, born in the Simpson Memorial Pavilion of Edinburgh Royal Infirmary, were re-weighed at 6 months. Mean weights in lb. for boys and girls, respectively, were 7.48 ± 0.89 and 7.26 ± 0.88 at birth and 17.23 ± 1.91 and 15.98 ± 1.76 at 6 months. Weights at 6 months were about 2 lb. above those published in 1926 for Scottish cities (Paton and Findlay, *Med. Res. Council. Rep. Spec. Rep. Ser. No. 101*). Separation into 4 birthweight categories showed that the order of weights was unchanged at 6 months. There was no relation between birthweight and weight increment in the first 6 months; this is in agreement with the findings of Parfit (Abst. 2424, Vol. 21) and underlines his suggestion that recording of weight increments should start from a common zero base line, not from birthweight.—W. M. Deans.

4967

THOMPSON, H. **Data on the growth of children during the first year after birth.** *Human Biol.*, 1951, **23**, 75-92. [Clin. Child Development, Yale Univ.]

The raw data from an extended pre-war study of height, weight and 7 other body measurements of healthy New Haven infants, 32 male and 36 female, at 4-week intervals during the first year of life (Gesell and Thompson, "The Psychology of Early Growth", MacMillan, New York, 1938; Abst. 2220, Vol. 8) are here published for the first time, with means and standard deviations of the 4-week increments from 8 weeks onward.

W. M. Deans.

4968

MEREDITH, H. V. **North American Negro infants: size at birth and growth during the first post-natal year.** *Human Biol.*, 1952, **24**, 290-308. [State Univ. Iowa, Iowa City.]

The literature comparing weights, heights and body measurements of North American negro and

white infants from birth to 1 year is analysed, the results are tabulated and the following conclusions are drawn:

The mean birthweight of viable negro infants is 3.23 kg. (3.28 kg. for infants above 2.2 kg. at birth); of white infants, 3.35 and 3.41 kg., so that the negro infant is on the average nearly 4 per cent. lighter than the white. Negro infants receiving adequate dietary and medical care from birth weigh on the average 7.44 kg. at 6 months and 9.87 kg. at 1 year, white infants 7.64 and 10.00 kg., so that by the end of the first year the difference is reduced to 2 per cent. Negro infants are about 1.0 cm., or 2 per cent., shorter at birth than white, but with adequate care there is no difference after 6 months. Head width, stem length, trunk and hip width are smaller in negro infants than in white, both at birth and during the first year.—W. M. Deans.

4969

NORVAL, M., KENNEDY, R. L. J. and BERKSON, J. **Biometric studies of the growth of children of Rochester, Minnesota. The first year of life.** *Human Biol.*, 1951, **23**, 273-301. [Dept. Paediat., Mayo Clin., Rochester, Minn.]

This is the first of a series of reports on healthy children, mainly of North European ancestry, from the rural farming community of Rochester, Minnesota, of economic status rather above average, during the period 1934 to 1945.

Length (in.) and weight (lb.) without clothing were obtained for 2079 boys and 2032 girls under 1 year, and the results for each sex at monthly intervals are shown in graphs and tables.

Boys were not only longer and heavier than girls of the same age but also heavier than girls of the same length. The mean weights were higher than most of those recorded in the literature. Boys were more variable than girls. The correlation between length and weight rose at first and then fell slowly to about +0.6 at about the sixth month and remained about the same thereafter. Monthly weight increments were at first greater in boys than in girls but tended to equality at the end of the year. Although infants of low birthweight tended to have larger weight increments, on the whole the infants in the 6 birthweight classes retained the same relative position in respect of both length and weight throughout the year.

W. M. Deans.

4970

ACHESON, R. M. and HEWITT, D. **Oxford Child Health Survey. Stature and skeletal maturation in the pre-school child.** *Brit. J. Prev. Social Med.*, 1954, **8**, 59-65. [Social Med. Unit, Univ. Oxford.]

The Oxford Child Health Survey was described in Abst. 2569, Vol. 20 and Title 812, Vol. 23.

In the 580 pre-school children studied, stages of maturation by Todd's standards were recorded and heights of children late in reaching these were compared with those of children who reached them early. Although X-ray photographs showed a range of maturity within each stage group there was evidence that slow maturers were taller and rapid maturers shorter than the mean.

The question whether those whose maturation is held back by an unfavourable environment follow the same pattern by tending to become rather tall was also considered. Data from subgroups of children whose parents belonged to social classes I or II and IV or V of the Registrar-General's classification were examined. [The numbers in these groups are not given but if the proportions were similar to those of the total of 3682 shown in Table 1, from which presumably the 580 children were selected, the number in classes I and II and IV and V together would be of the order of 14 per cent. of the whole sample for boys and 16 per cent. for girls.] For boys both maturation and growth were slower in the poorer than in the better classes but for girls only growth was retarded.—D. Harvey.

4971

DREIZEN, S., SNODGRASSE, R. M., PARKER, G. S., CURRIE, C. and SPIES, T. D. **Maturation of bone centers in hand and wrist of children with chronic nutritive failure. Effect of dietary supplements of reconstituted milk solids.** *Amer. J. Dis. Child.*, 1954, **87**, 429-439. [Dept. Nutrit. Metabol., Northwestern Univ., Chicago, Ill.]

Each of 82 children given a supplement was paired with a control who received no supplement. The supplement was equivalent in protein value to 6 qt. milk weekly for 20 months for 41 children aged 4 to 15 years and to 3 qt. weekly for 40 months for 41 children aged 1 year to 10 years 8 months. From the second group 19 children were arbitrarily selected to receive the equivalent of 12 qt. weekly for a further 6 months. X-ray examinations were made of 28 ossification centres in each child at the beginning and end of supplementation. All bone centres were retarded by chronic malnutrition. The centres which were least retarded made the greatest relative gains in response to the addition of milk to the diet. The mean maturation rate of all centres was directly related to the quantity of milk supplied.—F. C. Aitken.

4972

ABBIE, A. A. and ADEY, W. R. **Ossification in a Central Australian tribe.** *Human Biol.*, 1953, **25**, 265-278. [Dept. Anat., Univ. Adelaide, S. Australia.]

The results of X-ray photography of the wrist-hand and ankle-foot regions of infants, children and adolescents, 27 male and 31 female, mostly of the Ngalia tribe of Australian aborigines at the Yuendumu Settlement some 200 miles north-west of Alice Springs, are presented in tables, with 1 illustrative plate. The times of ossification fell within the normal European range but were generally nearer the earlier limit than the later. The aborigines showed the same tendency, greater in the female, towards suppression of the bones of the outer side of the foot as is found in Europe and there ascribed to civilisation, in particular, footwear.—W. M. Deans.

4973

BRYAN, A. H. and GREENBERG, B. G. **Methodology in the study of physical measurements of school children. 2. Sexual maturation—determination of immaturity points.** *Human Biol.*, 1952, **24**, 117-144. [Sch. Pub. Health, Univ. N. Carolina, Chapel Hill.]

Methods of analysis of quantal response are used to discover whether samples of boys or of girls differ significantly in their group mean age of sexual differentiation, in studies where observations are made only once on each child.

Data from routine medical examination of 101 girls and 86 boys showed the numbers of boys who were infantile in respect of genital development, pubic hair and axillary hair, respectively, and the numbers of girls infantile in respect of breast development, pubic hair, axillary hair and menarche, for each of 5 age groups from 9 years and over to 13 years and over. From the data, 30, 50 and 70 per cent. immaturity points were calculated for each characteristic, that is, ages at which it was estimated that these percentages of the population studied would be infantile. In computing the immaturity points, probit analysis, logit analysis, and Karber's method gave similar results. Karber's method is recommended as involving less computation than the others, and as being equally sound from a theoretical point of view for the limited data available.

In order to study the discriminatory power of the analyses, the data were divided into subgroups in a number of ways, according as the heights or weights of the children were above or below the averages for their ages. The results of these tests were satisfactorily in agreement with previous findings, showing that for girls the signs of maturity appear earlier in those who are taller or heavier at the ages studied than in those who are shorter or lighter. No such effect is found for boys, and it is suggested that the pubertal spurt in height and weight occurs later in boys than in girls, and would be most evident at ages beyond the range of the present data. As regards dis-

criminating power, the result showed that differences in 50 per cent. immaturity points of 0.8 to 1.0 year may be established from samples of girls numbering about 50.—I. McDonald.

4974

BERRY, W. T. C. and COWIN, P. J. **Conditions associated with the growth of boys, 1950-1.** *Brit. Med. J.*, 1954, i, 847-851. [Minist. Health, Savile Row, London, W.1.]

Although the nutrient intakes of children in the United Kingdom are considered adequate [at the time of the study] even in the lowest income group, well-marked differences of stature still exist between children of different social groups. Possible reasons are discussed and a preliminary investigation of the effect on growth of environmental conditions other than diet is described. The subjects, 1527 in all, were boys of 6, 10 and 14 years in the contrasted environments of Salford and Kingston-on-Thames and boys of 14 years in Bristol attending modern, grammar and public schools. Height (cm.), weight (kg.) and biacromial, bitrochanteric and chest measurements as a percentage of height are tabulated.

The Salford boys were shorter and lighter than the Kingston boys at all ages and at Bristol modern school boys were surpassed in both respects by grammar and they by public school boys. As was found by Weir (Abst. 2581, Vol. 23), the taller, heavier groups tended to be of slimmer build. Puberty, as judged from pubic hair, was delayed in Salford compared with Kingston, and in Bristol modern compared with Bristol grammar schools. There was a suggestion that pallor was associated with low weight, and thinness, judged by skinfold thickness, with low stature [full data not reproduced].

More detailed studies in Bristol on the effect of environment on weight are reported. (Height varied similarly, but in less degree.) Diets were classified as poor, average and good by asking the boys how much milk they drank and how often they had meat or fish, and fresh fruit. Mean weight increased progressively from poor to good diet. Weight also increased with standard of parental care, independently of diet, and among grammar, but not modern, school boys with social class (Registrar-General's classification). Boys who shared beds were lighter than boys of similar background who did not. The difference between boys from a housing estate and the centre of the city was not conclusive. No adverse effect of broken homes was found. Boys whose mothers went out to work were significantly heavier than boys whose mothers did not.

In the interpretation it is pointed out that some of the differences may reflect the environment of the past instead of the present. It is suggested

that "non-dietary factors cannot be ignored as a potential cause of checks to growth" and that they may act by affecting the appetite.

W. M. Deans.

4975

CLEMENTS, E. M. B. **Changes in the mean stature and weight of British children over the past seventy years.** *Brit. Med. J.*, 1953, ii, 897-902. [Dept. Anat., Univ. Birmingham.]

A survey is made of measurements of height and weight of British children, obtained in different urban centres over the past 70 years. It was found necessary to adjust the original results to allow for systematic differences in the methods of collection and classification. Where possible the data for each sex were separated into 3 groups according to social and economic background. The approximate dates of the measurements were 1880, 1905, 1920, 1940 and 1947, and the differences in mean height and weight over each of the 4 intervening periods are given for 5- to 7-, 8- to 10-, and 11- to 13-year-old boys and girls, in separate tables for each income group.

It was found that over the whole period there were significant increases, representing an acceleration in growth of about 18 months. The increases were greater in older than in younger children, and in the lower than in the upper income groups. The rate of increase appears to have been greatest in the inter-war years and to have been checked during both world wars.—I. McDonald.

4976

NEWCOMER, E. O. and MEREDITH, H. V. **Eleven measures of body size on a 1950 sample of 15-year-old white schoolboys at Eugene, Oregon.** *Human Biol.*, 1951, 23, 24-40. [Sch. Health Phys. Educat., Univ. Oregon, Eugene.]

4977

CLEMENTS, E. M. B. **The age of children when growth in stature ceases.** *Arch. Dis. Childhood*, 1954, 29, 147-151. [Dept. Anat., Univ. Birmingham.]

From a statistical study of 4-monthly height measurements, without shoes, of 75 boys and 67 girls of the upper income group, made in the periods 1949-52 and 1945-52, respectively, it was concluded that the mean age when growth ceases in boys is 17 years 9.08 months \pm 1.87 months (S.D. 9.96 months), and in girls 16 years 2.71 months \pm 3.44 months (S.D. 13.62 months). In some, there was a plateau [incidence and placing not defined] followed by a second period of growth.

On the average, growth ceases some 9 or 10 months earlier than at the time of the British Association Report (1883); but it is not clear whether this is due to a general tendency for all

children to mature earlier, or to a selective change, e.g., to a reduction in the frequency of older children who are still growing.—W. M. Deans.

4978

THOMSON, J. **The influence of age on the Tuxford Index.** *Health Bull., Dept. Health for Scotland*, 1953, **11**, 64–65.

A number of children aged exactly 3, 4, 5 and 10 years were selected from numbers born at the Royal Infirmary, Edinburgh. The mean Tuxford Index for boys of the above ages was 939, 957, 975 and 1073, respectively, and for girls 943, 964, 990 and 1070. In neither sex was the difference between the means of the 3- and 4-year-old group and the 4- and 5-year-old group significant, but in both sexes the difference between the 3- and 5-year-old group and the 5- and 10-year-old group was significant. No particular stress is laid on these averages, since the numbers measured were small.—A. W. Boyne.

4979

QUO, S. K. **Mathematical analysis of the growth of man, with special reference to Formosans.** *Human Biol.*, 1953, **25**, 333–358. [Dept. Hyg. Pub. Health, Coll. Med., Nat. Taiwan Univ., Taipei, Formosa.]

Weight change is taken as the best index of human growth, and records of weights and ages of about 87,000 male and 83,000 female Formosans from birth to 40 years, which were originally measured between 1938 and 1950, are examined. In the discussion of the data it is assumed that the comparisons between the mean weights of different age groups are equivalent to comparisons between the weights at different times of a single group of individuals followed up from birth.

When the age range was grouped as from birth to 9 months, 9 months to 5 years, 5 to 13 years and 13 years and upwards, equations of exponential type relating weight to age could be fitted. The constants of the equations for male and for female Formosans are given.

The data are discussed in relation to the functioning of the endocrine glands, with particular reference to changes after birth and at adolescence.

I. McDonald.

4980

MUÑOZ, J. A. and GUZMÁN, M. **Reporte preliminar sobre pesos y estaturas en escolares de Guatemala. [Preliminary report on the height and weight of schoolchildren in Guatemala.]** *Rev. Col. Méd., Guatemala*, 1953, **4**, 60–69.

4981

SCRIMSHAW, N. S., GUZMÁN, M. A. and TANDON, O. B. **Effect of aureomycin and penicillin on**

growth of Guatemalan school children. *Federation Proc.*, 1954, **13**, 477. [Inst. Nutrit. Central America and Panama, Guatemala.]

4982

URAM, J. A., FRENCH, C. E., BARRON, G. P. and SWIFT, R. W. **Terramycin or streptomycin in growth, reproduction and lactation.** *Federation Proc.*, 1954, **13**, 481. [Dept. Animal Nutrit., Pennsylvania State Univ., State College.]

Experiments with rats.

4983

BERRY, M. E. and SCHUCK, C. **Growth-promoting effect of aureomycin in rat.** *Federation Proc.*, 1954, **13**, 451. [Nutrit. Lab., Sch. Home Econ., Purdue Univ., Lafayette, Ind.]

4984

COX, G. J., MORGAN, P. V. and NATHANS, J. W. **Maximum growth of suckling rats.** *Federation Proc.*, 1954, **13**, 454. [Sch. Dent., Univ. Pittsburgh, Pa.]

4985

BENTLEY, O. G. **Rat growth response of egg yolks from hens fed antibiotics.** *Federation Proc.*, 1954, **13**, 181–182. [Dept. Animal Sci., Ohio Agric. Exp. Stat., Wooster.]

4986

GAVAN, J. A. **Growth and development of the chimpanzee; a longitudinal and comparative study.** *Human Biol.*, 1953, **25**, 93–143. [Yerkes Laboratories of Primate Biology, Inc., Orange Park, Fla.]

See also Absts. 4849, 4991, 5137, 5501, 5518, 5596.

REPRODUCTION AND LACTATION: MAMMALS

4987

GRAY, M. J. and PLENTL, A. A. **The variations of the sodium space and the total exchangeable sodium during pregnancy.** *J. Clin. Invest.*, 1954, **33**, 347–353. [Dept. Obstet., Coll. Phys. Surg., Columbia Univ., N.Y.]

Sodium space and total exchangeable Na were estimated with ^{24}Na in 10 primigravidae, of whom one subsequently developed mild pre-eclampsia and 3 others excessive nausea and vomiting. In 6, pregnancy was entirely uncomplicated. All babies were normal. Several estimations were made on each patient.

The average Na space was 24.4 per cent. of bodyweight (range 19.3 to 29.5) and the total exchangeable Na was 39.3 m. equiv. per kg. bodyweight (range 31.9 to 49.5). There was no evidence of Na storage, the 6 normal patients

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gaining an average of 510 m. equiv. during pregnancy and losing an average of 440 m. equiv. within a month *post partum*. The gains could be accounted for in the products of gestation and in the expanded maternal blood volume. "A possible explanation for the discrepancy between these data and those of others may be sought in the fact that . . . only exchangeable sodium has been determined while the classical balance studies consider the net gain in the sum of exchangeable and permanent sodium. One would have to assume that enormous amounts of sodium are stored in bone in a non-exchangeable form, and direct evidence to this effect does not exist."—A. M. Thomson.

4988

FEKETE, S. **The significance of mucopolysaccharides in the pathogenesis of toxæmias of pregnancy.** *Acta med. hung.*, 1954, **5**, 293–308. [Szövevény St. Municip. Hosp., Budapest.] Russian summary.

Weighed pieces of skin and subcutaneous tissue, obtained at caesarean section and other operations, were placed in duplicate in measured quantities (5 or 10 ml.) of distilled water, 0.85 per cent. saline and 5 per cent. saline. Solutions were maintained at 4° to 8° C., to minimise decomposition. The tissues were weighed after drying with filter paper at the end of 24 hr., and the Cl, N and sugar contents of the surrounding fluids were estimated. The tissues were returned to their fluids for a further 48 hr., 1 ml. of a 0.1 per cent. solution of hyaluronidase being added to one tube of each pair. The weighing and analyses were then repeated, 1 ml. of inactivated (heat-treated) hyaluronidase solution being added to the control tubes immediately before the tissues were weighed. It was found that the tissues take up water and release most of it when treated with hyaluronidase. This effect of hyaluronidase was more marked in tissues obtained from women during the second half of pregnancy, and was specially marked when oedema was present. There was little difference in effect between tissues immersed in the different solutions. In some cases, marked uptake and release of NaCl from tissue samples in 5 per cent. NaCl solution was noted. Similar but increased effects were noted when the experiments were repeated with samples of umbilical cord tissue. Samples of uterine muscle took up water and salt but did not release it on treatment with hyaluronidase. It is postulated that the mucopolysaccharide content of skin and subcutaneous tissue increases in pregnancy and especially in toxæmia. The effects observed "are attributed to the depolymerisation by hyaluronidase of hexosamine-containing mucopolysaccharides, whereupon they release salt and water".

A. M. Thomson.

4989

GABRAWY, B. and KAMAL, I. **Histidine excretion in normal and abnormal pregnancy.** *J. Obstet. Gynaecol. Brit. Empire*, 1954, **61**, 186–191. [Dept. Physiol., Med. Fac., Kasr-el-Aini, Cairo.]

Histidine was estimated by the method of Kapeller-Adler (*Quart. J. Exp. Physiol.*, 1949, **35**, 145) modified for use with urine. No significant difference was found in the excretion of histidine in men and women, pregnant or non-pregnant; patients with severe toxæmia of pregnancy excreted about the same amount as normal subjects on a low-protein diet. There appears to be no abnormality of histidine metabolism in pregnancy normal or abnormal, and earlier results suggesting such an abnormality are attributed to faulty methods of estimation.—I. Leitch.

4990

STARY, Z., EREZ, N., BODUR, H., ANHEGGER-LISIE, S. G. and ÇEPELOĞLU, R. **Über einige die spontane Frühgeburt begleitende Veränderungen der Proteine des mütterlichen Blutes. [Some changes in maternal blood proteins accompanying spontaneous premature labour.]** *Arch. Gynäkol.*, 1954, **184**, 330–336. [2. Frauenklin., Univ. Istanbul.]

During pregnancy there are 2 phases in the increase of serum protein-bound polysaccharides. In the 8th month, there begins an increase in the polysaccharides of the albumin fraction, which continues until shortly before the birth. Immediately before the birth there is a change in polysaccharide metabolism, and the excess of the albumin polysaccharides is replaced by an increase in the polysaccharides of the globulin fraction. In spontaneous premature labour this increase of the globulin-bound polysaccharides sets in prematurely and reaches a much higher level than with a normal birth.—M. B. Richards.

4991

WIEHL, D. G. and TOMPKINS, W. T. **Size of babies of obese mothers receiving nutrient supplements.** *Milbank Mem. Fund Quarterly*, 1954, **32**, 125–140. [Nutrit. Res. Clin., Pennsylvania Hosp. (Philadelphia Lying-in Hosp.).]

A total of 235 women who were obese at the beginning of pregnancy were given instructions for a restricted diet and in 4 comparable groups were given a vitamin or protein supplement, or both, or none. Compared with a group of 467 women of standard weight at the beginning of pregnancy the group of 235 obese women contained a larger percentage delivered late and a smaller percentage delivered early. Babies of obese women were on the average heavier than those of women of

standard weight. This was so even when comparison was restricted to babies born within 7 days of expected date of delivery. The babies of obese women were also longer. No correlation was found between birthweight and maternal weight gain during pregnancy.

In the group receiving both vitamin and protein supplements the percentage of women delivered within 1 week of the expected time was significantly higher than in the other groups. This was due chiefly to a significantly smaller percentage of early deliveries in the group given vitamin and protein supplements. Differences in weight of babies and in length of babies born within 1 week of expected delivery time in the 4 groups were not significantly different.—F. C. Aitken.

4992

GLASS, S. J. and LAZARUS, M. L. **Improved fertility and prevention of abortion after nutritional hormonal therapy.** *J. Amer. Med. Assoc.*, 1954, **154**, 908-910. [Fertility Clin., Cedars of Lebanon Hosp., Los Angeles, Calif.]

Clinical examinations and liver function tests were made on 22 men and 50 women attending a fertility clinic. All were given a diet providing optimum energy intake (designed to reduce weight when necessary), protein content of 1.5 to 2 g. per kg. bodyweight, 25,000 to 50,000 units vitamin A, foods rich in vitamin B complex, and 30 to 60 g. wheat germ daily. After 30 to 60 days on this diet treatment with sex hormones was begun.

Fertility with resulting pregnancy was restored to 19 of 34 nulliparous women and to 4 of 6 multiparae, but 4 of these 23 aborted. Of 10 women who had had 2 or more abortions, 8 had normal babies. Of the 22 sterile men, 15 had improved spermatogenesis and 10 of their wives became pregnant; one aborted. These results were achieved in from 4 to 22 months. Most of the patients showed improvement in general health. Results were much better than those obtained from hormonal treatment alone.—D. Duncan.

4993

SANYAL, S. N. **Sterility effect of *Pisum sativum* (Linn). 11. Studies in endometrial biopsy.** *Calcutta Med. J.*, 1954, **51**, 10-12. [Bacteriol. Inst., Calcutta.]

For earlier work see Abst. 3483, Vol. 24.

11. Microscopic examinations are described of biopsy material from a normal subject, from one multiparous woman after treatment with 200 mg., in two equal doses, of *m*-xylohydroquinone and from one woman known to be sterile. The treated subject showed inhibition of the secretory phase of the endometrium.—D. Harvey.

4994

BOYNE, A. W., CHALMERS, M. I. and CUTHBERTSON, D. P. Gleichgewicht und Verteilung des Stickstoffs bei der trächtigen und laktierenden Ratte. [Nitrogen equilibrium and distribution in the pregnant and lactating rat.] *Hoppe-Seyler's Ztschr.*, 1953, **295**, 424-435. [Rowett Res. Inst., Bucksburn, Aberdeenshire.]

The distribution of N in the tissues of pregnant and lactating rats was studied during the first and fifth reproductive cycles. An investigation of N equilibrium was made in the first reproductive cycle during the period from conception to the 16th day of lactation. No evidence was obtained of N storage in non-reproductive maternal tissues taken together, in either young or old pregnant rats. The increase of total N in the whole organism of pregnant rats is the result of the increase of total N in the reproductive tissues. In all cases the liver of pregnant and lactating rats showed an increase in weight and total N content over those of the controls. In the lactating rat the emptied and washed intestine showed, on the 16th day, a significant increase in weight and total N content. The investigations on N balance confirmed the results obtained from analysis of the tissues.

M. B. Richards.

4995

RAULIN, J. Rôle de la nature des lipides alimentaires dans l'action des surcharges de cholestérol sur le comportement du rat blanc. [Role of dietary lipids in the action of excess cholesterol on reproduction in the white rat.] *Arch. Sci. physiol.*, 1954, **8**, 1-26. [Lab. Biochim. Nutrit., C.N.R.S., Bellevue.]

Seven groups of rats were fed on diets containing (1) no fat, (2) 10 per cent. margarine and 5 per cent. lard, (3) 5 per cent. lard and 15 per cent. sunflower seed oil, (4) 15 per cent. margarine, (5) 20 per cent. sunflower seed oil (6) 7 per cent. margarine and 8 per cent. sunflower seed oil fatty acids and (7) 15 per cent. sunflower seed oil fatty acids. The remainder of the diet was casein, sucrose, cellulose, salt mixture and vitamins. Other groups of rats were given the same diets, but in addition received amorphous cholesterol, in amounts up to 3 per cent. of the diet.

As judged by the numbers and weights of offspring produced (dead and alive), cholesterol and the dietary fat had an influence on reproduction. In diets containing lard, cholesterol increased the average number per litter and the average weight of offspring. Reproductive performance was impaired by the highly unsaturated sunflower seed oil, more so when cholesterol also was given. When the fatty acids of sunflower seed oil and cholesterol were included in the diet, nearly all the foetuses died *in utero*; parturition occurred in the

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animals given the fatty acids alone, though several of the young were born dead.

The results are discussed in relation to a possible increase of formation of sex hormones associated with cholesterol and highly unsaturated fatty acids.

G. A. Garton.

4996

BONADONNA, T., BERG, E., OLGATI, L. and POZZI, G. C. Osservazioni preliminari sul contenuto in fruttosio, sulla fruttolisi dello sperma di "Bos Taurus" e sulle correlazioni con la fecondità. (Nota preventiva.) [Preliminary studies of fructose content of and fructolysis by the semen of *Bos taurus* and their relations to fertility. Preliminary note.] *Zootec. Vet.*, 1954, 9, 70-82. [Ist. Sper. Ital. L. Spallanzani, Milan.] English summary.

The fructose content of the semen of bulls of different ages, breeds and strains was estimated 1, 2 and 3 hr. after collection. There was great variation in the initial content even between different collections from the same bull. There was no correlation between the initial content and age. The higher the fertility of the bull as shown by records, the higher was the initial fructose content. High fructose contents were related also to greater libido. The rate of disappearance of fructose after collection was constant for individuals when the number of live spermatozoa in the semen was taken into account.—T. D. Bell.

4997

HYTTEN, F. E. Clinical and chemical studies in human lactation. 6. The functional capacity of the breast. *Brit. Med. J.*, 1954, i, 912-915. [Dept. Midwifery, Univ. Aberdeen.]

Measurement of breast size by water displacement is described. In a study of 86 primiparae and 23 multiparae there was a significant positive correlation between breast size and output of milk on the seventh day of lactation. Breast size was not related to milk composition. Breast enlargement during pregnancy was studied in 9 primiparae and 2 multiparae. In the primiparae there was a high positive correlation between breast enlargement during pregnancy and output of milk on the seventh day. There was no relation between initial size and subsequent enlargement. (For earlier parts see Abst. 2850, Vol. 24.)—F. C. Aitken.

4998

HAEGER, K. and JACOBSON, D. A contribution to the study of milk ejection in women. *Acta physiol. scand.*, 1953, 30, Suppl. 111, 152-160. [Obstet. Clin., Univ. Lund.]

The effects of oxytocin in a small group of women with painful engorgement of the breasts during the first week of lactation are described.

F. E. Hytten.

4999

CAMPBELL, B. and PETERSEN, W. E. Milk "let-down" and the orgasm in the human female. *Human Biol.*, 1953, 25, 165-168. [Dept. Anat., Univ. Minnesota.]

Five instances were studied in which milk let-down in women occurred during sexual intercourse. The suggestion is advanced that orgasm in the human female consists in a neurohumoral reaction of smooth muscle organs, often accompanied by a concurrent vestige of a male behaviour pattern involving contraction of the homologues of the muscles of ejaculation. The success of the reproductive act may be related to the first of these phenomena, but not to the second.—D. Duncan.

5000

BARTLETT, S., BURT, A. W. A., FOLLEY, S. J. and ROWLAND, S. J. Relative galactopoietic effects of 3:5:3'-triiodo-L-thyronine and L-thyroxine in lactating cows. *J. Endocrinol.*, 1954, 10, 193-201. [Nat. Inst. Res. Dairying, Univ. Reading.]

Oral doses of 16, 32 and 64 mg. 3:5:3'-triiodo-L-thyronine (T.I.T.) and 75 mg. L-thyroxine were compared in their effect on the milk yield and composition and the heart rate of dairy cows.

Milk yield was increased by all treatments, but the response to T.I.T. was far less, even at the highest level, than to L-thyroxine. L-Thyroxine increased butterfat percentage and reduced the concentration of alkaline phosphatase, but T.I.T. had no effect. No treatment affected the percentage of solids-not-fat. Heart rate gradually increased during L-thyroxine treatment. After 64 mg. T.I.T. it increased immediately and then slowly declined to normal; after smaller doses the effect was slight.

L-Thyroxine or T.I.T., 5 mg. daily, in single subcutaneous injections increased yield, butterfat and solids-not-fat percentages and heart rate, and reduced alkaline phosphatase. The response to T.I.T. was slightly greater. When the dose was given as 2.5 mg. twice daily the results were the same.—T. D. Bell.

5001

DUNCOMBE, W. G. and GLASCOCK, R. F. The contribution of dietary stearic acid to milk fat. *Biochem. J.*, 1954, 57, xi. [Nat. Inst. Res. Dairying, Univ. Reading.]

5002

COTES, P. M. and CROSS, B. A. The influence of suckling on food intake and growth of adult female rats. *J. Endocrinol.*, 1954, 10, 363-367. [Dept. Biochem., Univ. Cambridge.]

Growth increments and food intake in the first 14 days *post partum* were greater, both in normally

lactating rats and in suckled rats with galactophores cut to prevent milk withdrawal, than in unsuckled controls. The increased food intake of the rats with galactophores cut could not have been required for milk production, for test weighings showed that litters were unable to obtain milk from these rats. It seems, therefore, that the suckling stimulus, rather than the metabolic condition associated with milk secretion, is the important cause of increased food intake and extra growth of suckled animals. Daily injections of 3 I.U. prolactin in non-suckled rats did not reproduce the changes in bodyweight or food intake.—M. B. Richards.

5003

FOURNIER, P., SUSBIELLE, H. and BORDEAU, A. Le rôle protecteur du lait vis-à-vis du squelette de la rate allaitante. [**Protective role of milk on the skeleton of the lactating rat.**] *C.R. Soc. Biol.*, 1953, **147**, 1913-1916.
See Absts. 3491, 3492, Vol. 24.

5004

GIROUD, A. Malformations embryonnaires d'origine carentielle. [**Embryonic malformations of deficiency origin.**] *Biol. Rev.*, 1954, **29**, 220-250. [Fac. Méd., Paris.]

5005

CHENG, E. W., YODER, L., STORY, C. D. and BURROUGHS, W. **Estrogenic activity of various synthetic isoflavone derivatives and compounds isolated from different livestock feeds.** *J. Animal Sci.*, 1953, **12**, 944. *Proc.* [Iowa State Coll.]

5006

MAQSOOD, M. and PARSONS, U. **Influence of continuous light or darkness on sexual development in the male rabbit.** *Experientia*, 1954, **10**, 188-189. [Animal Res. Stat., Univ. Cambridge.] German summary.

See also Absts. 4399, 4409, 4499, 4586, 4615, 4684, 4716, 4739, 4743, 4870, 4988, 5069, 5104, 5135, 5385, 5483.

REPRODUCTION: BIRDS

5007

HAYS, F. A. **Artificial light for activating males and females to higher fertility.** *Poultry Sci.*, 1954, **33**, 321-327. [Massachusetts Agric. Exp. Stat., Amherst.]

Rhode Island Reds bred for high fecundity and housed at 8 to 10 breeding females per pen were used. Eggs were saved for a 6-week period in early February and March and subsequently hatched. The artificial lighting gave an intensity of 3 foot-candles at floor level and was switched on at 4 a.m. for 4 hr. to give light before natural

daylight. Control pens with natural daylight only were run concurrently. The experiments extended over 5 years.

All-night lights for 30 days from 1 January improved the fertility of cocks penned with pullets as the season advanced. Morning lights for 60 days gave higher fertility than in controls but produced no significant increase as the season advanced. The fertility of cockerels mated to old hens was not stimulated by all-night lights for 60 days; that of old males mated to pullets significantly declined; all-night lights for 30 days raised fertility in similar matings. Morning lights for 60 days decreased the fertility of cockerels mated to old hens, but had no effect on old males similarly mated. All-night lights for 30 days for males followed by all-night lights on male and female in the breeding pen gave a progressive decline in fertility through the hatching season. Morning lights in a similar set-up significantly stimulated both males and females to higher fertility.—M. J. Head.

SENESCENCE

5008

RENBOURN, E. T. and ELLISON, J. M. **Some blood changes in old age. A clinical and statistical study.** *Human Biol.*, 1952, **24**, 57-86.

Data were collected over a number of years for 140 people of 60 to 104 years of age. All were clinically healthy and none was bedridden. A subjective assessment of fitness for age was based on several weeks of observation, and was followed by blood tests to obtain values for haematocrit, erythrocyte sedimentation rate, red cell fragility, blood urea, blood chloride, blood cholesterol and blood pressure.

The data were analysed to test for differences between men and women, changes in mean values and variabilities with ageing and as compared with younger groups, differences corresponding to the different fitness assessments, and relations between measurements.

There is a review of the literature.

I. McDonald.

5009

MORGAN, A. F. and GILLUM, H. L. **Nutritional status of the aging: hematology.** *Federation Proc.*, 1954, **13**, 469. [Dept. Home Econ., Univ. California, Berkeley.]

5010

SILBERBERG, M. and SILBERBERG, R. **Factors modifying the lifespan of mice.** *Amer. J. Physiol.*, 1954, **177**, 23-26. [Snodgrass Lab., St. Louis City Hosp. Div., Mo.]

The mice were 205 males and 130 virgin females of strain C57BL and 128 males of strain DBA, both closely inbred strains. Some received the

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stock Purina laboratory chow, the rest the same diet with 24 per cent. added lard.

Males of strain C57 reached their maximum mean weight at 15 months of age on stock diet, but on high-fat diet they continued to put on weight until 22 months old, when their mean weight was 25 per cent. greater than that of mice on stock diet. In males of strain DBA the maximum mean weight was 24 g. on both diets, but was attained at 17 months on stock diet and at 11 months on high-fat diet. The deviations from the mean were much greater in C57 mice on high-fat diet than in others.

The high-fat diet shortened the lives of C57 males by 16 per cent. and of DBA males by 9 per cent., but did not affect survival of females. The females showed higher mortality at all ages than the males. The males of strain C57 lived longer than those of strain DBA, but the high-fat diet was more harmful to the former. While the greatest shortening of life was on average associated with the most conspicuous increase in body-weight, there was no consistent correlation between overweight and length of life in individuals.

D. Duncan.

See also Abst. 5303.

EXPERIMENTAL STUDIES OF IMMUNITY AND MICRO-ORGANISMS

5011

SCHNEIDER, J. and MONTÉZIN, G. *Pl. berghei* et lait. Absence d'action du régime lacté chez la souris. [*Plasmodium berghei* and milk. Absence of effect of a milk diet in the mouse.] *Bull. Soc. Pathol. exot.*, 1953, **46**, 947-952. [Lab. Chim. Thérap., Inst. Pasteur, Paris.]

Of mice weighing about 20 g., 13 were maintained on a diet of cow's milk and 6 on a normal diet; on the 3rd or 5th day of the milk diet all were infected with 25 million organisms of *P. berghei*. All the animals except one in each group died. Those on the milk diet survived somewhat longer, but there was little difference. The results did not confirm those of Maegraith *et al.* (Abst. 4848, Vol. 23) with the rat, but the mouse is more sensitive than the rat to *P. berghei*, the infection was much heavier and the diet was of milk without addition of B vitamins.

E. M. Hume.

5012

ASKONAS, B. A., CAMPBELL, P. N., HUMPHREY, J. H. and WORK, T. S. The source of antibody globulin in rabbit milk and goat colostrum. *Biochem. J.*, 1954, **56**, 597-601. [Nat. Inst. Med. Res., Mill Hill, London, N.W.7.]

In a goat and a rabbit antibody proteins were shown to pass into colostrum and milk, respectively, without degradation and re-synthesis.—D. Duncan.

5013

SCHNEIDER, H. A. and ZINDER, N. D. Concentration of the nutritional factor promoting resistance of the mouse to salmonella infection. *Federation Proc.*, 1954, **13**, 477. [Labs. Rockefeller Inst. Med. Res., New York.]

5014

SIROTNAK, F. M., DOETSCH, R. N., ROBINSON, R. Q. and SHAW, J. C. Aspartate dissimilation reactions of rumen bacteria. *J. Dairy Sci.*,

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1954, **37**, 531-537. [Dept. Bacteriol., Univ. Maryland, College Park.]

On incubation with washed cell suspensions and cell-free extracts of rumen contents succinate gave a total CO₂ production plus propionate yield similar to those of aspartate, but without NH₃ production. When malonate was used to inhibit CO₂ output without the inhibition of malate decarboxylase, NH₃ production exceeded CO₂ production.

On incubation with aspartate, after 5 hr. the fatty acid was mainly propionate, but thereafter this decreased and acetate increased. Butyrate was detected after the acetate concentration increased to about 40 per cent. of the total fatty acid. The yields of total fatty acids were high.

Alpha- and β-alanine produced no CO₂ or NH₃ with cell-free preparations and no fatty acid with washed suspensions of rumen organisms. Primary decarboxylation of aspartate was therefore unlikely. Oxaloacetate gave a similar result. Malate produced more CO₂ than aspartate, and acetate was the main fatty acid after incubation for 5 hr. Fumarate gave CO₂, but fatty acids did not accumulate. From these results and from the evidence of malonate inhibition it is concluded that these are unlikely to be intermediates in the dissimilation of aspartate.

Pyruvate gave a poor yield of CO₂ with the washed cell suspensions, and some unidentified gas. It gave rise mainly to acetate, with significant amounts of butyrate and propionate. Lactate produced little CO₂ and no acid.

Aspartate is thought to be degraded via succinate to propionate and then to acetate and butyrate. It is suggested that the dicarboxylic acids tested are not interconvertible in the rumen.

A. Dobson.

5015

WILSON, M. K. and BRIGGS, C. A. E. The normal flora of the bovine rumen. 1. Bacteriological methods for quantitative studies. *Vet. Rec.*,

1954, **66**, 187-188. [Nat. Inst. Res. Dairying, Shinfield, Reading.]

Counts of viable bacteria in the rumen contents were made in a reinforced clostridial medium buffered with NaHCO_3 and saturated with CO_2 . No improvement was found when this medium was enriched with horse serum, Tween 80 or cellobiose, but the addition of Tween 80 to dilution blanks resulted in consistent small improvements in counts. This may be due to more complete separation of bacteria from aggregations and from food particles by the physical properties of Tween 80. No great disparity in final count was found between incubation temperatures of 37°C . and 39°C . Ten days was the greatest time required for any bacterium which grew in this medium.

Samples were taken from adult cows with large fistulae. Tenfold serial dilutions made directly into the culture medium gave counts of 10^{10} and 10^{11} organisms per g. rumen contents. The organisms were chiefly Gram-positive cocci and rods of varied morphology. Gram-negative organisms rarely exceeded 10^6 to 10^7 . From this it is claimed that a considerable proportion of the viable population was cultivated *in vitro*. Seven minutes was the maximum time allowed between sampling and culturing. Replicate samples from 5 sites in the rumen, rumen liquor and solid material showed differences of up to a thousandfold in count, as did those from cow to cow, from hour to hour or day to day when 3 cows were sampled hourly for 25 hr. Variations due to diet were also as much as a thousandfold. The authors regard this as of particular importance, since other workers have considered smaller changes indicative of significant major alteration in the flora.

M. J. Dobson.

5016

HUHTANEN, C. N., SAUNDERS, R. K. and GALL, L. S. **Fibre digestion using the miniature artificial rumen.** *J. Dairy Sci.*, 1954, **37**, 328-335. [Nat. Dairy Res. Labs., Oakdale, Long Island, N.Y.]

Miniature artificial rumens consisting of dialysis tubing suspended in screw-cap jars and maintained in a synthetic saliva solution were used for studies of fibre digestion during 24-hr. periods. Fibre was estimated colorimetrically.

With 20 samples of alfalfa hay, fibre digestion was 47 ± 4 per cent. The effects of penicillin, aureomycin, bacitracin and terramycin on fibre digestion were studied with different concentrations of the antibiotics. All inhibited fibre breakdown to some extent and terramycin completely suppressed it even at low concentrations. The addition of starch and lactose to roughage depressed fibre digestion.

The technique did not call for constant neutralisation of the medium and was thus an improvement on Louw's artificial rumen.—D. M. Walker.

5017

BRIGGS, C. A. E., WILLINGALE, J. M., BRAUDE, R. and MITCHELL, K. G. **The normal intestinal flora of the pig. 1. Bacteriological methods for quantitative studies.** *Vet. Rec.*, 1954, **66**, 241-242. [Dept. Bacteriol., Nat. Inst. Res. Dairying, Shinfield, Reading.]

To study the conditions influencing counts of viable bacteria in the faeces of pigs, counts were made by the dilution technique using 3 media, one for the coli-aerogenes group, a clostridial medium and one for general counts.

Intra-sample variations were insignificant. Variations in counts due to delay in culturing of the faecal bacteria were not consistently found, but it is suggested that cultures should be set up as early as possible. Total counts of faecal bacteria showed that the numbers for pigs on a normal diet generally fell between 1.0×10^8 and 9.9×10^9 per g. wet weight. Total counts of faecal bacteria of pigs on two other diets fell within these limits and it is not thought that the quality and quantity of a ration influence the numbers of organisms in the intestinal flora, though variations in bacterial types may occur.

A comparison of counts and dry matter contents of faecal and caecal materials was made. The ratio of faecal to caecal dry weights, which was 1.9, was used to bring the counts of caecal bacteria nearer those of faecal bacteria. High dilution of faecal bacteria resulted in the growth of lactobacilli and streptococci. Coli-aerogenes bacteria were fewer than lactobacilli and streptococci as shown by growth in MacConkey's broth; and low dilutions plated direct resulted in the growth of micrococci, bacilli, *Pseudomonas* and moulds.

M. J. Dobson.

5018

COOK, F. D., BLAKELY, R. M., MACGREGOR, H. I. and ANDERSON, R. W. **The effect of antibiotics on the intestinal microflora of turkey poults.** *Poultry Sci.*, 1954, **33**, 38-40. [Dominion Exp. Stat., Swift Current, Sask.]

Day-old turkey poults were kept in heated brooders and given a mixed practical ration containing animal protein, with or without 9 p.p.m. procaine penicillin; 3 birds from each group were killed each week and the microflora of the gizzard, duodenum, small intestine, caeca and large intestine was examined.

The number of lactobacilli in the gizzard was low in both groups but rose steadily to the 4th week of age and was unaffected by the drug. Penicillin suppressed lactobacilli in the duodenum during the first 3 weeks but thereafter the numbers

in each group were similar, which suggested the development of resistant strains in the drug-fed group. Counts in the small intestine over the 5-week period clearly showed that penicillin consistently reduced the lactobacillus population. The drug had no effect on the number of lactobacilli in the caeca; in the large intestine the picture was similar to that in the duodenum. Coliform bacteria counts were made only in the large and small intestines and in the caeca; penicillin had no effect on the count in the last but raised the count 10 to 1000 times in each of the intestinal regions.

M. J. Head.

5019

BELASCO, I. J. The comparison of urea and protein meals as nitrogen sources for rumen micro-organisms. *J. Animal Sci.*, 1953, **12**, 907. *Proc.* [E.I. du Pont de Nemours and Co.]

5020

BENTLEY, O. G., VANECHO, S., HUNT, C. H. and MOXON, A. L. Nutritional requirements of rumen microorganisms for cellulose digestion *in vitro*. *J. Animal Sci.*, 1953, **12**, 908. *Proc.* [Ohio Agric. Exp. Stat.]

5021

WASSERMAN, R. H., SEELEY, H. W. and LOOSLI, J. K. The physiology and nutrition of a rumen lactobacillus. *J. Animal Sci.*, 1953, **12**, 935-936. *Proc.* [Cornell Univ.]

5022

BELASCO, I. J. Utilization of nitrogen compounds by the rumen microflora. *J. Animal Sci.*, 1953, **12**, 942-943. *Proc.* [E.I. du Pont de Nemours and Co.]

5023

WAINFAN, E., HENKIN, G., RITTENBERG, S. C. and MARX, W. Metabolism of cholesterol by intestinal bacteria *in vitro*. *J. Biol. Chem.*, 1954, **207**, 843-849. [Dept. Biochem., Sch. Med., Univ. S. California, Los Angeles.]

Homogenates of intestinal contents and faeces were prepared from rats which had been fed for about a year on a diet containing 1.5 per cent. cholesterol and 0.5 per cent. ox bile. The homogenates contained considerable quantities of cholesterol, which decreased on incubation. In control homogenates treated with alcohol or autoclaved no decrease in cholesterol was found after incubation.

Fifteen strains of cholesterol-metabolising bacteria were isolated in pure culture. The two most

active strains were *Aerobacter aerogenes* and *Pseudomonas jaegeri*. Addition of cholesterol to resting cell suspensions of these strains increased oxygen uptake and the cholesterol content of the flasks decreased with time by as much as 80 per cent. Addition of nicotinamide to resting cell suspensions of *A. aerogenes* increased the oxygen uptake when cholesterol was present, but no such effect was noted with dried cells which had been stored in the cold for several days, although these cells could still metabolise cholesterol. 2:4-Dinitrophenol increased the rate of cholesterol oxidation by both *A. aerogenes* and *P. jaegeri*. Rate of oxidation was related also to the number of viable cells in suspensions.—M. J. Dobson.

5024

GYLLENBERG, H., ROSSANDER, M. and ROINE, P. On the growth-inhibition of *Lactobacillus bifidus* by certain fatty acids. *Acta chem. scand.*, 1954, **8**, 133-134. [Dept. Nutrit. Chem., Univ. Helsinki.]

Growth of strains of *Lactobacillus bifidus* isolated from the faeces of breast-fed infants was inhibited *in vitro* by some fatty acids. Propionic and butyric acids had no effect, caproic acid was slightly inhibitory, and the inhibitory effect increased with the length of the carbon chain up to lauric acid, but with greater chain lengths toxicity declined again. Palmitic, stearic and oleic acids had some effect, but ricinoleic was about 5 times as effective as oleic acid.

Egg albumin, casein and blood albumin partly overcame the inhibitory effect of fatty acids, gelatine was less effective, and trypsin, pepsin or yeast extract had little or no effect.

Both human and cow's milk had detoxifying effects which were abolished by tryptic digestion.

D. Duncan.

5025

HILL, C. H. Studies on unidentified growth stimulants for *Streptococcus faecalis*. *Federation Proc.*, 1954, **13**, 461. [Dept. Animal Indust., N. Carolina State Coll., Raleigh.]

5026

GRILLO, M. A. Sul metabolismo della treonina nel *Saccharomyces cerevisiae*. [Threonine metabolism in *Saccharomyces cerevisiae*.] *Arch. Sci. biol., Bologna*, 1954, **38**, 145-154. [Ist. Chim. Biol., Univ. Turin.]

Extract of yeast decomposes threonine, with formation of acetaldehyde. In the process no oxidation and no formation of ammonia or α -ketobutyric acid is found. *d*- and *l*-Threonine are attacked with the same velocity. The process is activated by adenosine-5-phosphate, glutathione



and pyridoxal phosphate. If the yeast extract is previously treated with norite A less acetaldehyde is formed: the activity is restored by glutathione. Glutathione and pyridoxal phosphate, but not adenosine-5-phosphate, restore the activity to yeast inactivated by long dialysis. Biotin has no effect on the formation of acetaldehyde from threonine.—M. B. Richards.

MISCELLANEOUS FEEDING EXPERIMENTS

5028

ARULANANTHAM, R. **Supplementary effect of protein and amino acids with 'poor' rice diet of South India.** *Federation Proc.*, 1954, **13**, 449-450. [Dept. Biochem., Northwestern Univ. Med. Sch., Chicago, Ill.]

5029

KAGAN, M. J. O vliyanii sostava pishchi na regeneratsionnyi protsess skeletnoi muskulatry u myshei. [The influence of food composition on the process of regeneration of skeletal musculature in mice.] *Dokl. Akad. Nauk S.S.S.R.*, 1953, **91**, 683-686. [Leningrad Med. Inst.]

Leg muscles of mice were injured by cutting and the effect of the protein content of the diet on regenerative processes was studied. Five groups of mice received: (1) a natural balanced diet with protein content 18 per cent., (2) a synthetic balanced diet, (3) a restricted diet with 12 per cent. protein, (4) a low-protein, high-carbohydrate diet, 1.5 per cent. protein, (5) a high-protein, low-carbohydrate diet, 36 per cent. protein.

The animals were operated on 20 days after they had been on these diets. In groups 1 and 2 tissue breakdown terminated after 3½ days, and in groups 5, 4 and 3 after 4, 6 and 7 days, respectively. Regenerative processes began in groups 1 and 2 on the second day, but in group 3 not till the 6th day. Restoration of connective tissue was slower in groups 3 and 4 than in 1 and 2. In group 1 the wound was covered with disoriented muscle fibres, between which layers of connective tissue were formed. Wounds of group 3 animals were covered with atrophied muscle fibres of smaller diameter. Not only protein deficiency, but also excess, affects regeneration.—W. Hughes.

5030

GREEN, J. W., PEIFER, J., MCCOY, J. R. and ALLISON, J. B. **Influence of dietary protein on tensile strength of rat abdominal wall.** *Federation Proc.*, 1954, **13**, 220-221. [Bur. Biol. Res., Rutgers Univ., New Brunswick, N.J.]

5031

CONSTANT, M. A. and PHILLIPS, P. H. **Effect of diet and trace minerals on erythrocyte fragility**

5027

RITTER, W. **Ergebnisse neuerer Forschungen über die Ernährung der Milchsäurebakterien. [Results of recent studies of the nutrition of lactic acid bacteria.]** *Mitt. Geb. Lebensmittel. Hyg.*, 1954, **45**, 38-56. *Proc.* [Liebefeld, Berne.]

See also Absts. 4429, 4450, 4451, 4459, 4467, 4845.

and x-irradiation mortality in rats. *Proc. Soc. Exp. Biol. Med.*, 1954, **85**, 678-682. [Dept. Biochem., Coll. Agric., Univ. Wisconsin, Madison.]

Red blood cells of rats given a synthetic diet were less fragile than those of rats on 2 natural diets. The addition of cobalt to one of the latter diets reduced the fragility of the red cells, but with the other natural diet or the synthetic diet Co was without effect. Starvation and whole body exposure to X-rays were without effect on red cell fragility. Survival after exposure was poor in the group with the most fragile red cells, but even worse in the animals in which Co had been effective in reducing fragility.—D. Duncan.

5032

WILHELMJ, C. M., MILANI, D. P., MEYERS, V. W., GUNDERSON, D. E., SHUPUT, D., RACHER, E. M. and MCCARTHY, H. H. **Fasting and realimentation with high carbohydrate or high protein diets on capillary resistance and eosinophiles of normal dogs.** *Federation Proc.*, 1954, **13**, 165. [Dept. Physiol., Sch. Med., Creighton Univ., Omaha, Nebr.]

5033

AHMAD, N. D. and ATERMAN, K. **Liver function and hepatic necrosis due to deficient diet.** *Arch. exp. Pathol. Pharmacol.*, 1954, **222**, 273-283. [Dept. Pharmacol., Med. Sch., Univ. Birmingham.]

Male albino rats numbering 30, of average initial weight 127.2 g., were given a necrogenic diet (Abst. 4940, Vol. 20) and, where possible, bromosulphalein tests of their liver function were made. Nine died after having had the diet for between 27 and 58 days and before tests were made; all had hepatic necrosis. The 21 animals tested had had the diet for between 37 and 64 days and showed some impairment, their retentions of the dye ranging from 8.72 to 100 per cent. compared with 5.43 per cent. for normal control rats. The severity of the damage could not be correlated with the length of time on the diet. Nine more rats died between 2 and 24 days after the tests and showed hepatic necrosis at postmortem examination. Second tests were made between 36

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and 38 days after the first on the 12 survivors and it was apparent that, in most, the degree of liver damage increased with the passing of time. This functional liver damage could occur even when morphological changes were absent or very slight. It is concluded that dietary hepatic necrosis is an acute manifestation of a chronic deficiency state.

M. B. Richards.

5034

KAMRIN, B. B. **The effects of a high carbohydrate diet on the teeth of parabiosed albino rats.** *J. Dent. Res.*, 1954, **33**, 175-180. [Dept. Anat., Coll. Med., State Univ. New York, Brooklyn.]

A balanced non-cariogenic diet (Big Red Dog Pellets) containing 44 per cent. carbohydrate (manufacturers' analysis) was ground to pass a 30-mesh screen and powdered dextrose was added in equal volume, raising the carbohydrate content to 72 per cent. Ten pairs of parabiosed littermate Wistar rats were given the ground balanced diet, 7 pairs and 20 single rats the high-carbohydrate diet, all to appetite, from weaning to 120 days, when the rats were killed and the teeth were examined by probe under the microscope.

Addition of dextrose produced caries in both single rats and parabiosed rats. The effect was more marked in the latter, and the pattern and incidence in the 2 parabionts were almost identical; it is suggested that this may be useful in research on caries.—W. M. Deans.

5035

MUHLER, J. C. **Importance of type of diet during the suckling period on the incidence of experimental dental caries in rats.** *J. Dent. Res.*, 1954, **33**, 245-252. [Dept. Chem., Indiana Univ., Bloomington.]

Continuation of previous work (Abst. 5468, Vol. 20; 3936, Vol. 21) into the second generation of rats showed that the strain difference previously reported disappeared when both strains had a soft non-cariogenic diet from birth to 30 days, *i.e.*, before they were put on the cariogenic diet of coarse maize, and such rats eventually had less caries than those on the coarse maize diet from birth, from which it is concluded that newly erupted teeth are particularly susceptible to the effects of a cariogenic diet.

Stannous fluoride was again much more effective than sodium fluoride or stannous chloride in reducing the number of carious lesions, but in most groups the supplements were less effective in the second generation than in the first.—W. M. Deans.

5036

LARRIVEE, G. P. and ELVEHJEM, C. A. **Studies on the nutritional requirements of chinchillas.** *J. Nutrition*, 1954, **52**, 427-436. [Dept.

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Biochem., Coll. Agric., Univ. Wisconsin, Madison.]

The chinchillas numbered 67, were aged 2 to 9 months and appeared healthy. Conditions of housing are described. Synthetic diets with sucrose 37, vitamin-free casein 30, cottonseed oil and salt mixture each 4, vitamin mixture 2, potassium acetate 2.5, magnesium oxide 0.5 and cellulose or gum arabic 20 per cent. were prepared. The vitamin mixture contained neither vitamin C nor vitamin B₁₂. These diets were modified by reducing the amounts of K and Mg.

The variation in the roughage and in the K and Mg contents had no adverse effect, but from the nature of the faeces the cellulose diet was thought to be physiologically the better. The chinchilla differs from the guineapig in not requiring vitamin C.—D. Harvey.

5037

ORLAND, F. J., BLAYNEY, J. R., HARRISON, R. W., REYNIERS, J. A., TREXLER, P. C., WAGNER, M., GORDON, H. A. and LUCKEY, T. D. **Use of the germfree animal technic in the study of experimental dental caries. 1. Basic observations on rats reared free of all microorganisms.** *J. Dent. Res.*, 1954, **33**, 147-174. [Walter G. Zoller Mem. Dent. Clin., Chicago, Ill.]

The experimental animals were germ-free white rats from the Lobund Institute, Notre Dame. One group of 13, obtained by caesarean section, were hand-fed to weaning and kept in wire-bottomed cages, with 5 per cent. sucrose solution to drink; another group of 9, born naturally, were suckled by germ-free mother rats and bedded on wood shavings, with plain water to drink; both groups were housed in germ-free units (illustrated). Control groups of ordinary laboratory rats were in similar cages with similar beverages. All were fed from weaning on a diet of casein 20, ground polished rice 60, maize starch 0.5, cellophane spangles 3, fat 5, yeast extract 2, liver powder 2 and maize oil 1.6 per cent., fluorine-free salts 5 and vitamins. The diet contained 2.12 p.p.m. F and the sucrose solution 0.58. After from 137 to 256 days weights and skull and femur measurements were noted, the rats were killed and all molars were sectioned and examined by microscope and evaluated for caries in several different ways. A number of photomicrographs are reproduced.

The germ-free animals were smaller and lighter than the others, but growth and health were satisfactory. Their teeth were normally developed and showed normal wear. They seemed much cleaner than those of ordinary rats, and not a vestige of caries was found, even where traumatic fracture had occurred. All but one of the ordinary rats had caries; the average incidence was 4.8 carious molars per rat for those on wire floors with sucrose

solution and 3.2 for those on wood shavings and plain water. It was concluded that the rat does not develop caries in the absence of micro-organisms.

W. M. Deans.

5038

SUBRAHMANYAN, V., NATARAJAN, C. P., BHATIA, D. S., DESIKACHAR, H. S. R. and SANKARAN, A. N. **Utilization of *Agave* as an article of food.** *Bull. Central Food Technol. Res. Inst. Mysore*, 1953, **3**, 63-66.

Agave as the sole source of carbohydrate in a synthetic diet did not support growth of rats. Added as a non-leafy vegetable to a rice diet it produced better growth than the Knol-Khol which it replaced. The value of *Agave* was due mainly to its high Ca content.

It was concluded that *Agave* is a useful vegetable, but its use alone is not to be recommended even in an emergency.—P. C. Jowsey.

5039

BELL, J. M., GRAHAM, V. E., GIBSON, D. L. and LAWTON, W. C. **Increasing the food value of whey by yeast fermentation. 4. Feeding trials with mice.** *Canad. J. Technol.*, 1954, **32**, 55-59. [Dept. Dairy Sci., Univ. Saskatchewan, Saskatoon.]

Fermented whey powder was prepared as previously described (Abst. 4013, Vol. 23). It contained: water 5.3, protein 38.5, fat 12.1, Ca 2.5 and P 2.2 per cent., vitamin B₁ 3.6 mg. and riboflavin 21.3 mg. per lb. Weanling mice were given one of 2 basal diets containing: (1) wheat 66.0, oats 30.5 and minerals 3.5 parts; (2) maize starch 70, sucrose 3, minerals 4, cellulose 7, vitamin-free casein 13, crisco 3 and monosodium glutamate 0.25. Alternative B vitamin supplements were 2 per cent. dried brewer's yeast and 2 per cent. yeast-whey. Four protein supplements were yeast-whey alone or with methionine, dried skimmed milk or soya bean meal plus fishmeal plus alfalfa meal, to increase the total protein of the rations to 18 per cent. Food and water were allowed to appetite for 14 days.

With the grain diet, yeast-whey performed as well as any other protein supplement tested and B vitamins were adequate. Vitamin and methionine supplements had no effect. With the synthetic diet growth was significantly less with the yeast-whey as protein supplement than with skimmed milk, but when methionine was added to yeast-whey, growth was the same in the 2 groups. B vitamin supplements were without effect. Growth was poor when the soya-fish-alfalfa supplement was given alone, but addition of dried brewer's yeast produced good growth. Substitution of yeast-whey for brewer's yeast with this

protein supplement did not give good growth. It was considered likely that vitamin B₁ was lacking in yeast-whey.—P. C. Jowsey.

5040

KRASOVSKAYA, S. A. O rastitel'nykh kormakh russkikh vykhukholei. [**The plant food of Russian muskrats.**] *Zool. Zh.*, 1953, **32**, 534-538. [Khopersk. Gosud. Zapovednik.]

It has been shown that muskrats eat the following plants: *Scirpus lacustris*, *Sparganium ramosum*, *Typha latifolia*, *T. angustifolia*, *Alisma plantago-aquatica*, *Symphytum officinale*. They eat *Nymphaea candida* rarely, but they eat the seeds readily; *Nuphar luteum* is not often eaten, nor does *Stratiotes aloides* constitute regular food for them. A list is given of plants which muskrats would not eat at all.—W. Hughes.

5041

WEIMAR, V. **Macrocytic anemia and leucocytosis of guinea pigs with muscular stiffness disease.** *Proc. Soc. Exp. Biol. Med.*, 1954, **85**, 488-491. [Dept. Zool., Oregon State Coll., Corvallis.]

Deficiency of the anti-stiffness factor produced anaemia, mild to severe, in guineapigs. There was macrocytosis, with decreases in the red cell count and in Hb per cell. Diminution in the number of young red cells occurred as early as after 3 to 10 weeks, and high sedimentation rates after 2 to 6 weeks of deprivation. There was a marked rise in the white cell count, but this usually was not evident until 3 to 5 months. The white cell differential count indicated granulocytosis. In deficient males the Kurloff type of cell disappeared completely.—M. B. Richards.

5042

WILLIAMS, W. L. and ARONSOHN, R. B. **Effects of a British yeast plus casein diet on myocardial and hepatic injury in mice.** *Federation Proc.*, 1954, **13**, 166. [Dept. Anat., Univ. Minnesota, Minneapolis.]

5043

DE, N. K. **The alleged toxicity of Indian pulses.** *Indian J. Med. Res.*, 1953, **41**, 359-365. [Nutrit. Res. Labs., Indian Council Med. Res., Coonoor, S. India.]

The liver and kidney damage reported by Pal and Bose (Abst. 481, Vol. 14) in rats given diets high in pulses could not be produced, although mortality was high and many survivors suffered from paresis.

Addition of Ca and P to the high-pulse diet corrected deficiency of these elements, shown by chemical analysis; rats given the supplemented diet grew well and showed no sign of paresis.

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The "toxicity" of high-pulse diets is thought to be due to a simple deficiency of Ca and P and not to amino-acid imbalance or the absence of an unidentified growth factor, as postulated by earlier authors.—P. C. Jowsey.

5044

DASLER, W. **Partial protection against odoratism (sweet pea lathyrism) by diets high in gelatin or casein.** *Proc. Soc. Exp. Biol. Med.*, 1954, **85**, 485-488. [Dept. Biochem., Chicago Med. Sch., Ill.]

Weanling rats which were given diets containing from 30 to 50 per cent. ground sweet peas and 10 per cent. casein showed gross skeletal malformations within 21 days. High levels of gelatine, 30 per cent., or of casein, 40 per cent., delayed, but did not prevent, the onset of the condition. Casein gave better protection than did gelatine. No explanation can be offered at present for this partially protective action of gelatine and casein. It seems impossible that a deficiency of an essential amino-acid can be the cause of odoratism, since the animals continue to grow and show signs which are quite different from those produced by deficiency of any known amino-acid.

M. B. Richards.

5045

SCHILLING, E. D. **Crystalline substance from *Lathyrus odoratus* producing skeletal changes of lathyrism.** *Federation Proc.*, 1954, **13**, 290. [Dept. Biochem., Univ. Wisconsin, Madison.] Experiments with rats.

5046

McKAY, G. F., LALICH, J. J. and ANGEVINE, D. M. **Pathogenesis of bone lesions in rats fed sweet peas (*Lathyrus odoratus*).** *Federation Proc.*, 1954, **13**, 438-439. [Dept. Pathol., Med. Sch., Univ. Wisconsin, Madison.]

5047

PONSETI, I. V. and SHEPARD, R. S. **Lesions of mesodermal tissues in rats fed *Lathyrus odoratus* seeds.** *Federation Proc.*, 1954, **13**, 473. [Med. Sch., State Univ. Iowa.]

5048

BARNES, J. M. and DENZ, F. A. **The reaction of rats to diets containing octamethyl pyrophosphamide (Schradan) and oo-diethyl-S-ethyl-mercaptoethanol thiophosphate ("Systox").** *Brit. J. Indust. Med.*, 1954, **11**, 11-19. [Toxicol. Res. Unit, Serum Res. Inst., Carshalton Beeches, Surrey.]

Schradan and Systox are systemic insecticides, being absorbed into the plants they are used to spray. The drugs were incorporated into a stock diet to provide up to 50 p.p.m.; for Schradan 148 rats of both sexes were used, for Systox 120 female rats only.

With Schradan, only the male rats having 50 p.p.m. showed any sign of poisoning. They were weak and underweight for the first 18 weeks of the 52 weeks' experiment, but improved later. With Systox, only the rats having 50 p.p.m. were adversely affected; they showed typical signs of poisoning with a cholinergic drug, but recovered before the end of the 16 weeks' experiment. Tests for chronic toxicity of the conventional type thus showed that 50 p.p.m. Schradan and 20 p.p.m. Systox were harmless to female rats, but in a concentration of 3 p.p.m. both drugs produced a 30 per cent. inactivation of blood cholinesterase. Brain cholinesterase was affected also, and in rats having 20 p.p.m. Systox it was inhibited to the extent of 85 per cent. without sign of poisoning being apparent.

The far-reaching implications of the results are discussed.—E. M. Hume.

GENERAL METABOLISM AND FEEDING HABITS OF ANIMALS OTHER THAN MAMMALS AND BIRDS

5049

KUTSKY, P. B., EAKIN, R. M., BERG, W. E. and KAVANAU, J. L. **Protein metabolism of amphibian embryo. 4. Quantitative changes in free and non-protein amino acids.** *J. Exp. Zool.*, 1953, **124**, 263-277. [Dept. Zool., Univ. California, Berkeley.]

For earlier work see Absts. 1046, Vol. 22; 840, Vol. 21 and 5613, Vol. 20.

Quantitative changes in 7 free and 12 total non-protein amino-acids were investigated by microbiological estimation and by paper chromatography in 14 stages of development from the un-

fertilised egg to the completed neurula of *Rana pipiens*. No generalised pattern of behaviour of either free or total non-protein amino-acids was found. With the exception of glutamic acid, correlations with morphological events were not evident. Glutamic acid increased rapidly throughout the entire cleavage period, dropped sharply to mid-gastrulation, increased to late gastrulation, and showed an irregular decrease to the close of neurulation. The results are discussed in relation to biochemical studies of amphibian and other embryos, and to general studies of protein metabolism.—M. B. Richards.

5050

CHEN, P. S. and RICKENBACHER, J. **Concerning the free amino acids in amphibian development.** *Experientia*, 1954, **10**, 182-183. [Zool. Anat. Inst., Univ. Zürich.] German summary.

Free amino-acids were separated by paper chromatography of extracts from different developmental stages of the newts *Triton palmatus* and *T. alpestris*.

Free aspartic acid and glutamic acid were found in extracts from unfertilised eggs, in quantities sufficient to be separated in extracts of only 5 eggs. In the blastula and gastrula 4 more ninhydrin-positive substances appeared, and in young larvae 2 more, one identified as serine. In older larvae threonine, alanine, valine and leucine were found.

In *T. alpestris* at all stages was found a polypeptide complex consisting of aspartic acid, glutamic acid, serine, glycine, alanine, tyrosine and another unidentified acid. More detailed studies are in progress.—D. Duncan.

5051

BONTE, J. and VAN GANSEWINKEL, A. Contribution au rôle de la peau dans le métabolisme du sodium chez *Rana temporaria*. [Role of the skin in the metabolism of sodium in *Rana temporaria*.] *J. Physiol., Paris*, 1954, **46**, 5-9. [Inst. Vesale, Louvain.]

5052

RICCERI, G. Sull'assenza di enzimi uricolitici nei Cheloni marini (*Thalassochelys caretta*). [Absence of uricolytic enzymes in loggerhead turtles (*Thalassochelys caretta*).] *Arch. Sci. biol., Bologna*, 1954, **38**, 76-82. [Ist. Fisiol. Umana, Univ. Catania.]

Analysis of 3 specimens of the marine loggerhead turtle *Thalassochelys caretta* by 2 different techniques showed that neither in liver nor kidney was there an enzyme oxidising uric acid. This turtle thus resembles the tortoise (*Testudo graeca*) and the higher reptiles, which lack uricolytic enzymes, and differs from the freshwater tortoise (*Emys europaea*), which has in its liver the enzyme uricoxydrase, capable of oxidising uric acid without formation of allantoin.—M. B. Richards.

5053

RICCERI, G. La distribuzione della xantinossidasi negli organi delle diverse specie dei Cheloni, studiata in relazione al diverso carattere del loro metabolismo azotato e purinico. [Distribution of xanthine oxidase in the organs of different species of Chelonia, in relation to their different types of nitrogen and purine

metabolism.] *Arch. Sci. biol., Bologna*, 1954, **38**, 83-88. [Inst. Fisiol. Umana, Univ. Catania.]

See Abst. 959, Vol. 24.

5054

EGGERT, M. B. O pitanii sorokskoi sel'di. [The nutrition of the Sorokskoi herring.] *Zool. Zh.*, 1953, **32**, 490-494. [Karelo - Finsk. Otdel VNIROKh.]

Examination of the stomachs of Soroksky herrings indicate that their main food is mesoplankton, the larvae of Cirripedia, *Podon*, *Acartia*, *Centropages*, *Temora* and *Pseudocalanus*. There is very little difference between males and females in intensity of feeding and none between the sexes in the composition of their food.—W. Hughes.

5055

SIROVATSKII, I. YA. O biologicheskoi roli i rybokhozyaistvennom znachenii sudaka v vodokhranilishchakh. [The biological role and importance in fish culture of pike-perch in reservoirs.] *Zool. Zh.*, 1953, **32**, 480-483. [Nauch.-Issled. Biol. Inst., Rostov Gosud. Univ.]

From fish breeding experience on the Veselovsky reservoir over a number of years it has been shown that the pike-perch is of importance for the following reasons: it feeds on fish of low marketable value and so frees food reserves for more valuable fish; it suppresses the breeding of perch which as well as preying on other more valuable fish also compete with them for food; it feeds on bream only when great numbers of these breed and it hardly touches carp; it is marketable also.

W. Hughes.

5056

RICCERI, G. Interrelazioni fra le diverse forme dell'azoto nelle uova di *Bombyx mori* durante lo sviluppo embrionale. [Interrelations between the different forms of nitrogen in the eggs of *Bombyx mori* during embryonic development.] *Arch. Sci. biol., Bologna*, 1954, **38**, 89-95. [Ist. Fisiol. Umana, Univ. Catania.]

During development of the egg of the bumblebee, *Bombyx mori*, the amino-N of the mono-acids decreased by 177 mg. and the non-amino-N increased by 60 mg. per 100 g. egg, while the values of melanin N, amido-N and basic N did not change. Taking these results in conjunction with the earlier finding (Abst. 2122, Vol. 23) that the di-amino-acids were unchanged during the development of the egg, it is suggested that the precursors of the purine nucleus in the egg of *Bombyx mori* are to be sought among the mono-amino-acids.

M. B. Richards.

N.A. and R., October 1954

5057

ROCKSTEIN, M. and KAMAL, A. S. **Distribution of digestive enzymes in the alimentary canal of larvae of flies of medical and veterinary importance.** *Physiol. Zool.*, 1954, **27**, 65-70. [Labs. Zoophysiol., State Coll. Washington, Pullman.]

5058

GRAY, H. E. and FRAENKEL, G. **The carbohydrate components of honeydew.** *Physiol. Zool.*, 1954, **27**, 56-65. [Dept. Entomol., Univ. Illinois.]

Honeydew is the liquid excreted by certain insects after ingestion of large amounts of plant sap.

The insect selected was the citrus mealy bug, *Pseudococcus citri*, Risso. Nothing would induce the bugs at any age or stage to feed on any sort of artificial diet, so they were allowed to feed on the sap of Irish potato sprouts. The sap and the honeydew excreted were analysed. In honeydew, chemical tests showed the presence of uric acid, fructose and glucose, but not of dextrin. Studies of the carbohydrate content by paper chromatography with *n*-butanol, ethanol, acetone and water as solvent, and benzidine and trichloroacetic acid spray as developer, showed the presence of fructose, glucose, sucrose, fructomaltose (a recently discovered trisaccharide) and glucose-1-phosphate.

The mealy bugs suck the sap from the sieve-tubes of the phloem, but it was not possible to collect from the sieve-tubes separately, so the total sap of the potato sprouts was analysed. The carbohydrates revealed in the sap by paper chromatography were fructose, glucose, sucrose and glucose-1-phosphate, but not fructomaltose. The last is regarded as a product of digestion, and its presence in honeydew is taken as evidence that the honeydew is not, as has been suggested, the product of a simple process of filtration.

E. M. Hume.

5059

LIPKE, H., FRAENKEL, G. S. and LIENER, I. E. **Growth inhibitors. Effect of soybean inhibitors on growth of *Tribolium confusum*.** *J. Agric. Food Chem.*, 1954, **2**, 410-414. [Dept. Entomol., Univ. Illinois, Urbana.]

Soyin, crystalline trypsin inhibitor, and alkaline, acid or ethanol extracts of soya beans were without effect on the growth of larvae of *Tribolium confusum* or *Tenebrio molitor*. Material precipitated by ammonium sulphate from an extract made at pH 4.6 from raw soya beans was toxic to all larvae when included at 2.5 per cent. of the diet. The extract also depressed the activity of vertebrate trypsin *in vitro*.

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Growth of larvae on diets containing raw soya beans was poor, and the relative freedom of stored soya beans from insect attack may be due to a toxin.—D. Duncan.

5060

FRAENKEL, G. and PRINTY, G. E. **The amino-acid requirements of the confused flour beetle, *Tribolium confusum*.** *Duval. Biol. Bull.*, 1954, **106**, 149-157. [Dept. Entomol., Univ. Illinois, Urbana.]

The diets contained casein or amino-acid mixture 15 parts, maize starch 85, salt mixture 2 and vitamin B₁, riboflavin, nicotinic acid, pyridoxine, pantothenic acid, choline, inositol, folic acid and biotin. Each vial contained 10 first-stage larvae on 1 g. dry diet. The efficiency of the diet was assessed by the number and average weight of larvae surviving when those on control diet reached full growth, and also by the time taken to reach pupation.

Tribolium larvae grew as well on the mixture of 19 amino-acids used by Rose *et al.* (Abst. 4591, Vol. 18) as on casein, but growth was slower on the same authors' mixture of 10 amino-acids. The mixture used by Almquist and Grau (Abst. 3386, Vol. 14) was much inferior. Larvae of *Tenebrio molitor* and *Dermestes vulpinus* failed to grow on any of these mixtures.

Starting from the mixture of 10 amino-acids essential for rats, each proved essential also for *Tribolium*. Each of the 9 "non-essential" amino-acids in the mixture of 19 could be omitted without noticeable ill effect, though growth was always faster with the 19 than with the 10. None of the amino-acids was toxic in double the usual amount. D-Forms of methionine, phenylalanine and possibly lysine were fully or partly used, but D-forms of the other amino-acids were inactive.—D. Duncan.

5061

NOLAND, J. L. **Sterol metabolism in insects. 1. Utilization of cholesterol derivatives by the cockroach *Blattella germanica* L.** *Arch. Biochem. Biophys.*, 1954, **48**, 370-379. [Med. Labs., Army Chem. Centre, Md.]

Newly hatched nymphs of the German cockroach (*Blattella germanica*, L.) were fed on synthetic diets containing a series of 41 sterol derivatives. Growth response was then estimated from the average weight of the nymphs at 30 days of age or the average age at which maturation occurred.

Nymphs given the basal diet without sterol survived, but gained little weight. Addition of increasing amounts of cholesterol up to 0.05 per cent. of the diet occasioned an almost linear growth response; further addition of cholesterol caused only a slight increase in growth. With sterol

derivatives a free or esterified hydroxyl group at position 3 was essential for growth, but ring unsaturation at position 5 was not. Cholesteryl chloride had an adverse effect on growth; this effect was reversed when excess cholesterol was given.

The results are discussed in relation to the possible participation of a cholesterol esterase in sterol absorption by insects.—G. A. Garton.

5062

NOLAND, J. L. **Factors influencing the biosynthesis of cholesterol by the cockroach.** *Federation Proc.*, 1954, **13**, 106–107. [Chem. Corps Med. Lab., Army Chem. Centre, Md.]

5063

REDDY, D. B. and MICHELbacher, A. E. **Nature of food and its influence on rice weevil.** *J. Econ. Entomol.*, 1953, **46**, 1098. [Univ. California, Berkeley.]

Rice weevils (*Sitophilus oryzae*, L.) were reared from the egg at 26.6° C. and 70 per cent. relative humidity in ordinary wheat grains or the same wheat boiled for 1 hr. and allowed to dry; the moisture contents of the wheat were 13.6 and 12.2 per cent., respectively.

Weevils took on the average 33 days to emerge from boiled wheat and 30 days from unboiled wheat, but were heavier, average 1.39 mg. compared with 1.20 mg., despite the fact that the moisture content of the unboiled wheat was more favourable for the development of weevils. The percentage increase in weight in 4 months was slightly greater for weevils on unboiled wheat.

It was concluded that boiling may have affected the physical or chemical properties of the wheat or the availability of nutrients.—W. M. Deans.

5064

MISBA, J. N. and RANGANATHAN, V. **Digestion of cellulose by the mound building termite, *Termes (Cyclotermes) obesus* (Rambur).** *Proc. Indian Acad. Sci. [B]*, 1954, **39**, 100–113. [Tech. Development Establishment Labs., Kanpur.]

Cellulase and cellobiase activity were studied in extracts of the gut of worker termites. The enzymes were extracellular, and bacterial cultures

prepared from the gut did not enhance the activity of gut extracts. There was slight cellobiase activity in the foregut and midgut, but most of the cellobiase and all the cellulase were in the hindgut.

King, queen, alate, soldier and nymph termites had no cellulase, but king, queen and alate forms had cellobiase.

Some characteristics of the enzymes are described.—D. Duncan.

5065

BEERSTECHER, E. (Jr.), CORNYN, J., CARDO, L. and VOLKMANN, C. **Protein and amino acid requirement of a crustacean, *Oniscus asellus*.** *Federation Proc.*, 1954, **13**, 180. [Dept. Biochem., Sch. Dent., Univ. Texas, Houston.]

5066

GIESE, A. C., BRANDT, C. L., JACOBSON, C., SHEPARD, D. C. and SANDERS, R. T. **The effects of starvation on photoreactivation in *Colpidium colpoda*.** *Physiol. Zool.*, 1954, **27**, 71–78. [Dept. Biol. Sci., Stanford Univ.]

The injurious effect of ultraviolet light on certain organisms is reversed or "photoreactivated" by subsequent illumination with visible light.

The protozoa were starved for 48 hr. Their rate of division was estimated when fed or starved and subjected to a series of doses of ultraviolet light of wavelength 265.4 mμ., with or without subsequent reactivation by measured amounts of blue light of wavelength 435 mμ.

On exposure to ultraviolet light, division was much more retarded in starved colpidia than in fed ones. Much larger doses, up to a certain limit, of blue light were needed to reactivate colpidia that had been starved before exposure to ultraviolet light. The dose of blue light needed increased with the dose of ultraviolet light given. Blue light in excess of a certain amount had a retarding and not a reactivating effect on starved but not on unstarved colpidia. Starved and unstarved colpidia received some protection if they were exposed to daylight before exposure to ultraviolet light. Feeding starved colpidia after exposure to ultraviolet light and before exposure to blue light had little auxiliary beneficial effect.

E. M. Hume.

See also Absts. 4324, 4538, 4539.

5. HUMAN DIET IN RELATION TO HEALTH AND DISEASE

DIET

REQUIREMENTS

5067

PASSMORE, R. **Recent investigations on human calorie requirement.** *Chem. and Indust.*, 1954, No. 20, 556-560. [Dept. Physiol., Univ. Edinburgh.]

5068

INSTITUTO DE NUTRICIÓN DE CENTRO AMÉRICA Y PANAMÁ, GUATEMALA. **Recomendaciones nutricionales para las poblaciones de Centro América y Panamá. [Recommendations for the feeding of the peoples of Central America and Panama.]** *Bol. Ofic. sanit. panamer.*, 1953, Suppl. 1, 119-121.

5069

AISENBERG, M. F. **Opyt ratsionalizatsii pitaniya beremennykh. [An experiment in rationalizing the diet of pregnant women.]** *Vop. Pitani.*, 1954, 13, No. 2, 9-16. [Minist. Zdravookhran. Ukr. SSR, Kiev.]

The principles which should govern dietary prescribing at different stages of pregnancy are stated. The composition and energy value of a number of important dietary ingredients are tabulated and a weekly specimen menu is given.

D. W. Taylor.

5070

PRAIS, S. J. **The estimation of equivalent-adult scales from family budgets.** *Econ. J.*, 1953, 63, 791-810. [Dept. Appl. Econ., Univ. Cambridge.]

A quantitative study was made of the effects of household composition on expenditure. Comparisons are made between the effects on consumption resulting from the addition of a person of some particular age-sex group and those resulting from the addition of a standard person, taken as an adult male. Other types are thus measured as fractions of the adult male and so, for any household, the number of equivalent adult males may be expressed in terms of these coefficients. There will be a different set of coefficients, specific to each separate item of consumption, and also a general set, associated with the overall household income per equivalent adult, which will be a weighted average of all the specific sets. Household consumption of one commodity per equivalent adult male may be supposed to be some function of household income per equivalent adult male, and thus total consumption of the commodity will be affected both by the specific and by the general (income) equivalent adult scales.

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The theoretical framework developed along these lines is applied to a sample of 2200 family budgets collected in the United Kingdom in 1937-38, and specific scales are calculated for 6 different groups of foodstuffs and for total food. Eight different types of person are distinguished, from infants under one year to adult males. In the calculation the general coefficients were all taken equal to unity, as the simplest first approximation. Once the specific scales were all derived they could be used to give a more accurate general scale, and the calculations were then repeated. Some assumption is necessary concerning the nature of the functional dependence of mean consumption on mean income. Two possibilities are in fact investigated and both are found to give very similar results. The least squares solutions to the equations set up were found by an iterative process using the Cambridge electronic computer.

While the paper is primarily concerned to describe a method of analysis, the results are also given, and show that in the sample investigated females consumed about 15 per cent. less than males, and children under school age about 50 per cent. less.—I. McDonald.

5071

CHAKRAVARTI, N. and BANDYOPADHYAY, K. S. **A note on the consumption of cereals per adult unit in Calcutta.** *Sankhyā, Indian J. Statistics*, 1953, 13, 215-218. [State Statist. Bur., Govt. W. Bengal.]

The data were from those collected in the Family Budget Enquiry 1950-51 made by the West Bengal Government; they referred to the total monthly consumption of cereals by 5 units, adult male, adult female and children 10 to 14, 6 to 10 and 2 to 6 years of age. Total monthly expenditure levels of Rs. 101 to 200 and 201 to 350 only were considered; the numbers of families and persons in the groups were 400 and 1937, 374 and 2360, respectively. At the lower level consumption was 13.85, 12.50, 11.45, 8.03 and 7.10 and at the higher 13.83, 13.32, 10.91, 9.59 and 8.20 seers for the respective age groups (1 seer = 2 lb.). From these data conversion factors were calculated, 1.00, 0.90, 0.83, 0.58 and 0.51 for the lower and 1.00, 0.96, 0.79, 0.69 and 0.59 for the higher expenditure group and they are compared with the Lusk factors and those proposed by Aykroyd (*Abst.* 2277, Vol. 10). It is concluded that consumption of cereals in Calcutta is probably slightly short of requirement.—D. Harvey.

FEEDING OF INFANTS AND CHILDREN

5072

HUNGERLAND, H. El problema de los prematuros. [The problem of prematurity.] *Rev. española Pediat.*, 1954, 10, 201-212. [Giessen.]

5073

DE TONI, E. (Jr.) Osservazioni sulle differenti direttive dietetiche nell'alimentazione dei prematuri. [Different dietary regimes for feeding premature infants.] *Lattante*, 1953, 24, 458-463. [Ist. Clin. Pediat. G. Gaslini, Univ. Genoa.] English summary.

The method of feeding premature infants in the Centro Prematuri is briefly described, chief reliance being placed always on human milk.

E. M. Hume.

5074

KAUHTIO, J. Indwelling polyethylene tube in the feeding of premature infants. *Acta paediat.*, 1954, 43, 43-48. [Child. Clin., Univ. Helsinki.] French, German and Spanish summaries.

Seventy-three premature infants were fed during the first weeks of life through an indwelling nasal polyethylene tube. Eight died; the others did well. The advantages of the technique are discussed.—F. C. Aitken.

5075

PÆRREGÅRD, P. Blood in the faeces of premature infants. A sequel of iron medication. *Acta paediat.*, 1954, 43, 208 (with discussion 209). *Proc.*

5076

CASTAÑEDA, G., AGUIRRE, F., GUZMÁN, M. and MÉNDEZ, J. La nutrición del niño en su primer mes de vida. [The nutrition of infants in the first months of life.] *Congr. Méd. Nac., Guatemala*, November 1952.

5077

CAMPBELL, W. A. B. and CHEESEMAN, E. A. Some aspects of breast-feeding in Belfast. *Brit. J. Prev. Social Med.*, 1954, 8, 51-58. [Royal Maternity Hosp., Belfast.]

The incidence of breast feeding among mothers confined at the Royal Maternity Hospital was compared with that among mothers confined elsewhere in Belfast. Of 279 live births in the hospital group 242 infants were followed for 6 months; the number of controls followed was 258.

The results showed no appreciable difference between hospital and control groups and combination of the groups gave a picture representative of Belfast. At the end of the first week about

three-quarters, at the end of the first month one-half, and at the end of 2 months one-third of the infants were wholly breast fed.—F. C. Aitken.

5078

STICKLER, G. B. and HARRIS, L. E. Zum Thema der Säuglingsernährung. [Infant feeding.] *Deutsch. med. Wochenschr.*, 1954, 79, 923-925. [Mayo Found., Rochester, Minn.]

An article on artificial feeding of infants in the United States, with special reference to demand feeding, evaporated milk, mass-produced cereal foods and meat, fruit and vegetable purées, the methods practised in Rochester, and the work of one of the authors on the problem of adding carbohydrate (Abst. 1073, Vol. 22).—W. M. Deans.

5079

JOCHIMS, J. and WILCKHAUS, I. Über die Eignung von "Sterilmilch" zur Ernährung von Säuglingen. [Suitability of "sterile" milk for infant feeding.] *Ztschr. Kinderheilk.*, 1954, 74, 530-546. [Kinderklin., Staät. Krankenhaus Süd, Lübeck.]

Feeding experiments were made with 477 infants of ages from birth to 10 months to test whether sterile milk prepared by the Stork procedure is suitable for infant feeding. The sterile milk diets were compared with similar diets prepared from milk with the same fat content which had been pasteurised and again heated to 90° C. All diets contained $\frac{1}{2}$ or $\frac{2}{3}$ milk with rice gruel (Reisschleim) or Mondamin and 5 per cent. sugar, vitamins being supplied by fruit or vegetables. The average duration of the observation periods was 26.4 days. In the sterile milk group 49.8 per cent. of the infants progressed without disturbance, in the pasteurised milk group 56.4 per cent. The difference between groups did not quite reach statistical significance but it cannot be ignored. Moreover, in all aspects, except resistance to infection, which was the same in both groups, the pasteurised milk group did slightly better than the sterile milk group. Examples of this were in the occurrence of dyspepsias and the proportion of slight cases, in the curative value of the diet in dyspepsia, and in tolerance of overfeeding. The difference between the groups is sufficiently great to indicate that the 2 forms of milk cannot be regarded as equal for infant feeding. It is pointed out, however, that where hygiene is less good than in a children's hospital, the better keeping qualities of the sterile milk may give it a value not indicated in the present experiments.—M. B. Richards.

5080

GÜTZLAFF, W. and JOCHIMS, J. Über Magenverweildauer und Labfähigkeit von Sterilmilch. [Retention in the stomach and curdling of

N.A. and R., October 1954

sterile milk.] *Ztschr. Kinderheilk.*, 1954, **74**, 547-552. [Kinderklin., Städt. Krankenhaus Süd, Lübeck.]

X-ray photographs of 40 infants showed that when a diet was prepared with sterile instead of pasteurised milk, the emptying time of the stomach was shortened by 21.8 min. Studies *in vitro* showed that sterile milk did not curdle with rennet in weak acid and that addition of calcium lactate restored the effectiveness of the rennet. It is assumed that changes in the soluble salts and proteins during the sterilisation process were responsible for both phenomena.—M. B. Richards.

5081

WALTNER, K., TÖRÖK, J. and KOMÁROMI, O. Die Bedeutung des Invertzuckers in der Säuglingsernährung. [**Importance of invert sugar in infant feeding.**] *Acta med. hung.*, 1954, **5**, 415-417. [Kinderklin. Med., Univ. Szeged.]

From experience with both sick and healthy infants it is recommended that invert sugar be used exclusively in the preparation of both diluted milks and curative diets, instead of ordinary sugar and foods containing dextrin and maltose. The tolerance of infants for invert sugar is considerably better than for ordinary sugar, and permits the intake of greater amounts without disturbance, a matter of importance in illness. Preparation and use of the invert sugar is extremely simple; boiling of the sucrose for 5 min. with the amount of citric acid generally used for acidifying infants' food converts it completely to dextrose and fructose, and the required amount of starch or cereal can then be added to this solution. Boiling 1.5 g. citric acid in 50 ml. water with 80 g. sugar for 5 min. and diluting to 100 ml. gives a syrup containing approximately 4 g. invert sugar in 5 ml. This syrup, besides being used for the ordinary sweetening of infants' diets, has been given regularly to infants with hepatitis.—M. B. Richards.

5082

BARTA, L. and NÉMETH, E. **Fat tolerance tests in infants.** *Acta med. hung.*, 1954, **5**, 231-240. [1. Dept. Paediat., Med. Sch., Univ. Budapest.] Russian summary.

A group of 21 infants, of which all except 4 were over 6 months of age, were given after an 8-hr. fast 2 g. butter per kg. bodyweight in tea containing 5 per cent. sugar. A control group were treated similarly except that butter was not given. The fatty acid content of the blood was estimated fasting and 4, 5 and 6 hr. after butter. The daily fluctuations of blood fatty acids were studied in a third group of 20 infants on normal diet. In a fourth the effect of a ketogenic diet was studied

in 15 infants. They received their evening meal and at 2 a.m. were given a milk preparation with saccharin. At 8 a.m. they were given 2 g. butter per kg. bodyweight in tea and in the course of the morning they were given 50 to 100 g. unsweetened tea. Total ketones in the blood were estimated fasting, then at midday and 1 p.m.

The infants were graded according to developmental quotient, *i.e.*, ratio of actual weight to normal weight for age; quotients ranged from 0.4 to 1.2. A significant rise in blood fatty acid in response to ingestion of butter occurred in atrophic infants as well as in infants of higher developmental quotients, but atrophic infants on a ketogenic diet did not have the high levels of ketone bodies which were found in the blood of infants of better development when they were given a ketogenic diet.

There was no hepatic dysfunction in the atrophic infants, but pituitary hypofunction is believed to have existed.—F. C. Aitken.

5083

JEFFERSON, D. L. **Child feeding in the United States in the nineteenth century.** *J. Amer. Dietetic Assoc.*, 1954, **30**, 335-344. [Pacific Palisades, Calif.]

5084

SOUTHMAYD, E. B. and MARIOKA, M. **Vegetables in the child's menu at the hospital.** *J. Amer. Dietetic Assoc.*, 1954, **30**, 450-452. [Dept. Home Econ., Univ. California, Los Angeles.]

In a study of 29 children aged 3 to 4 years in a nursery school the percentages of children rejecting different raw vegetables and fruits were lower than the percentages rejecting cooked vegetables at lunch. The implications for hospital diet planning for children are discussed.—F. C. Aitken.

5085

VEDRASHKO, V. F. Rezhim pitaniya zdorovykh detei doskol'nogo vosrasta i ego fiziologicheskoe obosnovanie. [**A dietary regime for the healthy pre-school child and its physiological basis.**] *Vop. Pitan.*, 1954, **13**, No. 3, 19-25. [Inst. Pitan., Akad. Med. Nauk SSSR, Moscow.]

Extensive investigations were made on 40 children aged 5 to 6 years, to determine the most satisfactory distribution of total food intake and total calories between meals, requisite intervals between meals and whether the main meal should precede or follow the mid-day sleep. Details of diet composition and food values are given. The best X-ray method of measuring gastric emptying

time is discussed fully. The main recommendations are : 4-hr. intervals between meals, approximately equal amounts per meal and the daily sleep following the second meal of the day.

D. W. Taylor.

5086

SUR, G., REDDY, S. K., DORAISWAMY, T. R., SANKARAN, A. N., BHAGAVAN, R. K., SWAMINATHAN, M. and SUBRAHMANYAN, V. **Partial replacement of cereals by Mysore flour.** *Bull. Central Food Technol. Res. Inst. Mysore*, 1954, **3**, 85-87.

Forty-eight girls, aged 5 to 11 years, in an institution in Mysore were divided into 2 paired groups, one receiving the ordinary institution diet (poor vegetarian) and the other the same diet but with 2.25 oz. wheat and 2.25 oz. jowar replaced by 4.5 oz. of a mixture of 75 per cent. tapioca flour and 25 per cent. groundnut cake flour (Mysore flour). The experiment lasted for 6 months and height, weight, red blood cells, Hb and nutritional score were estimated before and after the experiment.

No difference was found between the groups except that Hb was significantly higher in the experimental group. It is concluded that Mysore flour can be used in times of scarcity to replace 50 per cent. of the cereals in the diet of children. See also Abst. 3552, Vol. 24.—J. S. Thomson.

5087

REDDY, S. K., SUR, G., DORAISWAMY, T. R., SANKARAN, A. N., SWAMINATHAN, M. and SUBRAHMANYAN, V. **Effect of supplementary composite protein food on the growth and nutritional status of school children.** *Bull. Central Food Technol. Res. Inst. Mysore*, 1954, **3**, 87-88.

The composition per oz. of a food supplement is 22.4 g. protein, 0.166 g. Ca, 0.304 g. P, 2.9 mg. each of vitamin B₁, riboflavin, Ca pantothenate and pyridoxine, 0.9 mg. folic acid and 11.4 mg. nicotinic acid (Indian Patent No. 47580, 1953). Two paired groups, each of 11 girls between 7 and 11 years of age on a boarding school diet, were selected. One was given 1 oz. of the food daily per head, the other a pudding made from 25 g. maize starch, each addition being sweetened with 1 oz. sugar. The experiment lasted for 10 weeks.

Calculated values for the school diet showed inadequacy of energy, protein, Ca and riboflavin. Statistical analyses indicated that the data for height, weight and nutritional deficiency score as defined by the Nutritional Advisory Committee of the Indian Council for Medical Research (Rep. Sci. Advisory Board, 1944) differed significantly in favour of the protein food group; group differences for Hb and red blood cell counts were not statistically significant.—D. Harvey.

5088

REDDY, S. K., SUR, G., DORAISWAMY, T. R., SANKARAN, A. N., SWAMINATHAN, M. and SUBRAHMANYAN, V. **Effect of supplementary composite protein food on the growth and nutritional status of school children.** *Indian J. Physiol. Allied Sci.*, 1954, **8**, 26-33. [Central Food Technol. Res. Inst., Mysore.]

The composite protein food (see previous Abst.) was again tested over 10 weeks on a group of 10 girls between 7 and 11 years of age in an institution, who received 1 oz. daily. On the average their height and weight gains were significantly greater than those of a matched control group given an isocaloric supplement of maize starch and sugar, and their Hb value and nutritional status also improved.—W. M. Deans.

5089

REDDY, S. K., SUR, G., DORAISWAMY, T. R., SANKARAN, A. N., SWAMINATHAN, M. and SUBRAHMANYAN, V. **Institution feeding experiment with a new type of balanced food.** *Bull. Central Food Technol. Res. Inst. Mysore*, 1954, **3**, 136.

Twenty schoolboys aged 10 to 15 years were divided into 2 groups; one received the institution diet, the other the same diet with half of the cereals replaced by the composite food. The experiment lasted for 2 months. Gains in height, weight and Hb during the period were greater in the experimental than in the control group, that in weight being statistically significant. Hip width, red blood cell count and nutritional deficiency score did not show corresponding differences in favour of the experimental group.—D. Harvey.

See also Absts. 4717, 5267.

DIETARY SURVEYS AND INDIVIDUAL STUDIES

5090

WILCOX, E. B. and GALLOWAY, L. S. **Children with and without rheumatic fever. 1. Nutrient intake, physique, and growth. 2. Food habits.** *J. Amer. Dietetic Assoc.*, 1954, **30**, 345-350; 453-457. [Dept. Foods Nutrit., Utah State Agric. Coll., Logan.]

1. For 131 children with a history of rheumatic fever and 131 controls nutrient intakes were computed from 1-week records of food consumption. The girls in the control group were consuming significantly more energy, protein, fat, Fe, vitamin B₁ and nicotinic acid than the girls in the rheumatic fever group. In the rheumatic fever group slightly more children were underweight and of borderline or poor physique than in the control group.

2. Results are presented in terms of servings of 15 food groups. Average daily intakes of the foods were similar for the 2 groups of children. Milk

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supplied a higher proportion of total energy, calcium, vitamin B₁ and riboflavin than any other food group.—F. C. Aitken.

5091

NYGREEN, M. S. **Foods eaten by college students. Acceptability, adequacy, and cost.** *J. Amer. Dietetic Assoc.*, 1954, **30**, 359-362. [Lincoln, Nebr.]

Standard portions of each food served in the women's residence halls of a university were weighed for a week and protein, vitamin B₁, riboflavin and ascorbic acid contents were computed. Students eating all of 3 meals daily could obtain the National Research Council's recommended allowances of these nutrients, but many students missed meals or rejected nutritious foods. The average daily cost of food served was 83 cents per head.—F. C. Aitken.

5092

WIDDOWSON, E. M., EDHOLM, O. G. and McCANCE, R. A. **The food intake and energy expenditure of cadets in training.** *Brit. J. Nutrition*, 1954, **8**, 147-155. [Med. Res. Coun. Dept. Exp. Med., Univ. Cambridge.]

The study was on the food intake and energy expenditure for a week of 77 cadets aged 18½ to 20 years in a training establishment of the armed forces. Two groups of observers were present. The cadets themselves recorded their daily intake and activities. The total intake of the 77 was estimated by weighing all the food provided for each meal, the unserved portions and the plate waste and by weighing and measuring the foods and drinks served in the canteen. Food obtained from other sources could not be checked. Recorded activities were compared with the official timetable and are considered to give a "reasonably accurate" picture. "Several" measurements of oxygen consumption were made during fitness training and drill. Energy expenditure on other activities was estimated from the collected figures of Orr and Leitch (*Nutrit. Abst. Rev.*, **7**, 509) and those of Passmore *et al.* (*Abst.* 558, Vol. 23).

The average daily intake of all the cadets was 3705 Cal., 2527 or 68 per cent. from food eaten in the dining hall, 20 per cent. from the canteen and the rest from food obtained outside. The food provided for the cadets could supply 3714 Cal., but only two-thirds was eaten. The greatest wastage of calories was in bread. The average daily energy expenditure was 3420 Cal., the difference between highest and lowest amounting to 775 Cal.

The reasons for the dislike of the official feeding arrangements are discussed. It was clear the failure of the cadets to gain weight was not due to

an insufficient supply of food. The bought food contained more fat and alcohol and somewhat less protein, carbohydrate, Ca and Fe than that provided.—D. Duncan.

5093

MIRONE, L. **Hemoglobin level and dietary intake of adults.** *J. Clin. Nutrit.*, 1954, **2**, 38-42. [Dept. Nutrit., Sch. Home Econ., Univ. Georgia, Athens.] Spanish summary.

Hb values, range and mean, were for 139 men 13.04 to 18.23 (16.13 ± 0.09) and for 396 women 10.39 to 16.83 (13.99 ± 0.05) g. per 100 ml. Heights and weights were measured and the averages are tabulated with percentages over and underweight. No relation was found between the distribution of underweight and Hb values. Subjects were asked to record food intake and from the records nutrient intakes were computed. The mean intakes for men and for women agreed well with National Research Council recommended allowances, except for Ca, where the average intake of the women fell short of the recommended intake.—F. C. Aitken.

5094

KARVONEN, M. J. and TURPEINEN, O. (with ARPPE, M. and LUUKKA, A.) **Consumption and selection of food in competitive lumber work.** *J. Appl. Physiol.*, 1954, **6**, 603-612. [Inst. Occupational Health, Vet. Coll., Helsinki.]

A study was made of the consumption and selection of food by 40 men during the Finnish National Woodcutting Competition of 1951.

Mean values were for energy intake 5460 Cal. daily and for loss of weight by those completing the competition 1.2 kg. The correlation of work performance with food consumption in the individual was not significant and with weight loss only approached significance. The high work output of the competitors was due primarily to economical working methods, not to a higher energy expenditure than that of the average lumberjack. Similarly, within the group of competitors the best workers achieved their results chiefly by greater skill and to a less extent by using more energy. Empirically, the lumberjacks had acquired food habits, such as the use of sugared drinks, which are in accordance with recommendations based on recent physiological research (see also *Abst.* 1008, Vol. 24).

M. B. Richards.

5095

BRANSBY, E. R. **The nutrition of male industrial workers with particular reference to intake and expenditure of calories.** *Brit. J. Nutrition*,

1954, 8, 100-111. [Minist. Health, 23 Savile Row, London, W.1.]

To study the relation of heaviness of work to intake of energy, 174 men were medically examined and, in most, measurements were made of their height, weight and blood pressure and of the Hb and pseudocholinesterase content of blood. Information was obtained also on the grade of their work, classified as light, light to medium, medium to medium heavy, or heavy, and on the time they spent on out-of-work activities. Allowances made for other-than-work exertions were 1.1 Cal. per min. for B.M.R., reduced by 10 per cent. for the period of sleeping; a 6 per cent. addition to basal amounts for specific dynamic action; additions for other activities, based on published and unpublished work by Passmore *et al.* (Abst. 558, Vol. 23). The sum of these expenditures was subtracted from the total intake of energy calculated from a dietary survey made by the weighing method for a week and the difference was used to calculate the energy expenditure per min. according to heaviness of work.

Average weekly consumption for 152 men in the diet survey is tabulated for 21 items of food; largest in amount were bread 77, milk and cream 76, potatoes and chips 62, fruit puddings, pies and milk sauces 35 and meat 31 oz. weekly. Calculated daily nutrient intakes were energy 3549 Cal., protein, vegetable 54 and animal 55, fat 138, carbohydrate 435 and Ca 1.3 g., Fe 21, vitamin B₁ 1.7, nicotinic acid 14, riboflavin 1.8 and vitamin C 42 mg. and vitamin A 4171 I.U.

For 137 men for whom complete data were available and whose nutritional status was satisfactory, average energy intakes for the 4 grades of work were light 3269, light to medium 3446, medium to medium heavy 3476 and heavy 3903 Cal. daily. In the same order average energy expenditures were: on basal metabolism 1550, 1532, 1533, and 1534; on specific dynamic action 93, 92, 92 and 92; on out-of-factory activities 788, 759, 838 and 692 and on work 838, 1063, 1013 and 1585 Cal. The average cost of the grades of work was 2.2, 2.7, 2.6 and 3.8 Cal. per min.

Relative expenditure of time was: work 27.9, sleeping 35.4 and other activities 36.7 per cent. Of the total expenditure of energy on out-of-work activities cycling, sitting, dressing, domestic work and walking accounted for 20.6, 19.8, 17.4, 16.7 and 13.1 per cent., respectively; the remaining 12.4 per cent. was used in gardening 5.0, games 4.0, standing 2.1 and lying down, fetching and carrying 1.3.

An earlier finding (Ministry of Health, "On the State of the Public Health", H.M.S.O., 1950) of no difference existing between the intakes of energy by groups of men with different degrees of activity was not confirmed.—D. Harvey.

5096

KEYS, A. and KEYS, M. H. **Serum cholesterol and the diet in clinically healthy men at Slough near London.** *Brit. J. Nutrition*, 1954, 8, 138-147. [Lab. Physiol. Hyg., Sch. Pub. Health, Univ. Minnesota, Minneapolis.]

Serum cholesterol values for 48 healthy men, aged from 40 to 55 years, workers in small factories at Slough, who were known to be consuming a diet supplying on the average 3427 Cal. daily (range 2095 to 4942), of which 35.4 per cent. (range 28 to 43) came from fat (for details see previous Abst.), were compared with those for men of similar age in Minnesota (Abst. 5242, Vol. 20) and Naples (see next Abst.), who got about 40 and 20 per cent., respectively, of their energy from fat.

The Slough men were thinner than the Americans or the Italians, but are believed to have been representative of Englishmen in both bodyweight and diet. Their serum cholesterol values, mean 250 mg. per ml., S.E. 5.8, were similar to those of the Americans and significantly exceeded those of the Italians (mean 231, S.E. 7.5). In the Slough data there was a correlation between serum cholesterol and age of the type already demonstrated for Minnesota data but not with relative bodyweight, and when the effects of age and relative bodyweight were eliminated, none with the percentage of energy supplied by fat.

The literature on serum cholesterol in man is discussed. A table shows average daily intakes of cholesterol-containing foods and of cholesterol in the United Kingdom and the United States, estimated both from dietary surveys and from national food consumption data, from which it is clear that the daily cholesterol intake in the United States is possibly twice that of working-class people in the United Kingdom. But serum cholesterol is not related to cholesterol intake and it is only when the percentage of calories from fat is high (of the order of 30 per cent. or more) that serum cholesterol rises in middle age.

W. M. Deans.

5097

KEYS, A., FIDANZA, F., SCARDI, V., BERGAMI, G., KEYS, M. H. and DI LORENZO, F. **Studies on serum cholesterol and other characteristics of clinically healthy men in Naples.** *Arch. Int. Med.*, 1954, 93, 328-336. [Lab. Physiol. Hyg., Sch. Pub. Health, Univ. Minnesota.]

In a group of 83 men serum cholesterol rose by about 3 mg. per 100 ml. per year from age 20 to the early thirties, a rise which corresponded to that found in men of the same age in Minnesota. Thereafter, unlike the Americans, the Italians showed no further age trend, so that by age 50 there was a mean difference of about 30 mg. per 100 ml. between the Italians and the Americans.

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In the Italians, as in the Americans, no relation was found between serum cholesterol and relative obesity. Electrocardiographic age trends which were clear in the Americans were small or absent in the Naples group.

The men studied in Naples were consuming diets which conformed to the Italian national diet pattern of 20 per cent. of energy from fat, and they were judged to be at least as obese as their American counterparts who consumed diets of which 40 per cent. of the energy was from fat.

The results are discussed, and it is pointed out that the incidence of coronary and myocardial disease among middle-aged men is much greater in the United States than in Italy.—F. C. Aitken.

5098

KEYS, A., VIVANCO, F., RODRIGUEZ MIÑON, J. L., KEYS, M. H. and CASTRO MENDOZA, H. **Studies on the diet, body fatness and serum cholesterol in Madrid, Spain.** *Metabolism*, 1954, **3**, 195–212. [Lab. Physiol. Hyg., Sch. Pub. Health, Univ. Minnesota, Minneapolis.]

Height, weight and skinfold thicknesses were measured and serum cholesterol was estimated in 60 men and 61 women living in Vallecas, a poor sector of Madrid, and in 61 professional men.

A one-week diet study of the Vallecas families showed a low energy intake, with total fats accounting for 27 per cent. of the total. The diets of the professional men appeared to be high in energy and fat and conformed to average United States intakes.

At all ages the Vallecas men were shorter and thinner than the professional men. The latter and the older Vallecas women conformed closely to United States standards for relative bodyweight; the younger women were usually thin.

Serum cholesterol values in the professional men and in the younger Vallecas men were similar to values obtained in a study of Americans in Minnesota, but in the Vallecas men values tended to decline from the middle thirties instead of rising, so that at ages 45 to 55 years they were much lower than in the professional men and Minnesotan men of the same age. In the women values tended to rise with age to about 40 years with little further change. The class difference in serum cholesterol was not ascribable to relative obesity, but within the Vallecas groups serum cholesterol was positively correlated with relative bodyweight. Re-analysis of data obtained 10 years earlier in Madrid gave good agreement with the present data. Comparison of the serum cholesterol values with data obtained elsewhere showed that at age 45 years and older values for the Vallecas men were similar to those for Neapolitans with 20 per cent. of energy from fat, whereas those for the professional men were of

the same order as for Londoners with 35.4 per cent. of energy from fat and for the Minnesotans with about 40 per cent. of energy from fat.

The data are discussed with reference to the indication from vital statistics that degenerative heart disease is much less common among Spanish men than among Americans of the same age.

F. C. Aitken.

5099

HARDINGE, M. G. and STARE, F. J. **Nutritional studies of vegetarians. 1. Nutritional, physical, and laboratory studies. 2. Dietary and serum levels of cholesterol.** *J. Clin. Nutr.*, 1954, **2**, 73–82; 83–88. [Dept. Nutr., Harvard Sch. Pub. Health, Boston, Mass.] Spanish summary.

1. Of 200 subjects studied, 86 were lacto-ovo-vegetarians, 26 were pure vegetarians and 88 were non-vegetarians. The subjects were adults, adolescents and pregnant women. There was only 1 adolescent and no pregnant woman among the pure vegetarians. Diets were studied by the diet history method, the course of pregnancy was recorded, physical examinations were made and laboratory tests of blood included estimations of blood pressure, packed cell volume, red cell counts, total and differential white cell counts, serum protein, albumin and globulin.

Group average intakes of nutrients approximated to U.S. National Research Council recommended allowances. Physical examinations, laboratory tests and studies of the course of pregnancy revealed no significant difference between vegetarian and non-vegetarian except that pure vegetarians were lighter in weight than non-vegetarians and lacto-ovo-vegetarians although their energy intakes were almost the same.

2. In the 3 groups cholesterol intakes were computed and serum cholesterol was estimated. Intake was higher among non-vegetarians than among lacto-ovo-vegetarians; the diets of pure vegetarians were cholesterol-free. Serum cholesterol values within a group were not related to bodyweight but tended to increase with advancing age. The adult non-vegetarians had higher serum cholesterol values than adult lacto-ovo-vegetarians; both groups had higher values than adult pure vegetarians.

No case of hypertension occurred among pure vegetarians; its frequency of occurrence was about the same in the non-vegetarian and lacto-ovo-vegetarian groups.—F. C. Aitken.

5100

CLARK, F. and FINCHER, L. J. **Nutritive content of homemakers' meals. Four cities, winter 1948.** *U.S. Dept. Agric., Agric. Information Bull.* No. 112, March 1954, pp. iv + 67.

Over 1000 housewives supplied estimates of quantities of foods eaten by them in the 24 hr. preceding the interview. Results are presented in terms of foods and nutrients. The average diet was low in calcium and riboflavin and supplied only 1780 Cal. The effects of age and socioeconomic circumstances on the nutritive value of the diet, the contribution of each meal to the day's food and the nutritive content of food consumed at home and away from home, are analysed.

F. C. Aitken.

5101

BAUM, E. L. and CORBRIDGE, I. L. **Household income, food expenditures and desires in Seattle, Washington.** *J. Farm Econ.*, 1954, **36**, 135-139. [State Coll. Washington.]

A study of food expenditure over 2 weeks of 646 randomly selected households in Seattle in September 1950 showed the usual tendency for the percentage of household income spent on food to decline with increasing income. Sixty per cent. of those with an income of \$2000 or under would have liked to spend more on food, but only 24 per cent. of those with over \$5000. The strongest desire was for more and/or better meat and poultry; next, but well behind, came fruit and vegetables, and milk, almost level.

The economic implications are discussed and it is concluded that a food subsidy to low-income groups to insure minimum standards of nutrition in times of depression would tend to increase and stabilise food consumption.—W. M. Deans.

5102

JORDAN, M., KEPES, M., HAYES, R. B. and HAMMOND, W. **Dietary habits of persons living alone.** *Geriatrics*, 1954, **9**, 230-232. [Westchester County Dept. Health, White Plains, N.Y.]

Diet histories were obtained from 24 men and 76 women, aged 65 or older, living alone. Diets were compared with a standard diet in terms of servings of 7 food groups. The outstanding shortcomings of the diets were underconsumption of yellow and leafy green vegetables, dairy products, and citrus fruits, tomatoes or salad greens.

F. C. Aitken.

5103

MCGANITY, W. J., CANNON, R. O., BRIDGFORTH, E. B., MARTIN, M. P., DENSEN, P. M., NEWBILL, J. A., MCCLELLAN, G. S., CHRISTIE, A., PETERSON, J. C. and DARBY, W. J. **The Vanderbilt cooperative study of maternal and infant nutrition. 5. Description and outcome of obstetric sample. 6. Relationship of obstetric performance to nutrition.** *Amer. J. Obstet. Gynecol.*, 1954, **67**, 491-500; 501-527. [Div.

Nutrit., Dept. Biochem., Sch. Med., Vanderbilt Univ., Nashville, Tenn.]

For Parts 1 to 4 see Abst. 3558, Vol. 24.

5. The obstetrical histories of the patients are described and comparable data from the literature are summarised.

6. Between 10 and 15 per cent. of the mothers developed one or more clinical abnormality of pregnancy, labour and puerperium, and 25 of these abnormalities were differentiated for study, the nutritional status of the patients concerned being compared with the picture determined for the complete group. It is assumed that "when gestation was uneventful minor aberrations in the over-all nutritional status of the mother were of no real importance". For the whole group of 2046 patients, average nutrient intakes fell somewhat below U.S. National Research Council recommendations, and a general decrease was found during the third trimester compared with earlier stages of pregnancy. No case of frank deficiency disease was found, and "in the realm of so-called 'subclinical signs' of dietary deficiency, extreme inconsistencies between examiners emphasised the nebulous nature of many of the proposed stigmas".

A series of tables compares the dietary and laboratory findings for the abnormal subgroups with those for the whole group. In general, the findings were either negative or "the occurrence of statistically significant differences is a reflection of the large groups involved. The actual arithmetical differences are small and the averages compared are made up of overlapping individual values." The more interesting findings included, among pre-eclamptic and eclamptic patients low nutrient intakes generally, significantly low only for nicotinic acid and total energy. On the other hand, these patients were more obese than average, and their slightly reduced intakes seem to have resulted from medical advice to reduce consumption. The mothers of premature infants were more liable than average to have been classified as clinically undernourished, but the only dietary finding to match was a below-average intake of ascorbic acid. Mothers who took less than 1500 Cal. and 50 g. protein daily during the third trimester had a high incidence of pregnancy disease in general. In summary, from this study in the United States "there is no clear indictment of nutritional lack as an important aetiological agent in the numerous conditions studied".

A. M. Thomson.

5104

MACY, I. G., MOYER, E. Z., KELLY, H. J., MACK, H. C., DI LORETO, P. C. and PRATT, J. P. **Physiological adaptation and nutritional status during and after pregnancy.** *J. Nutrition*, 1954, **52**, Suppl. 1, pp. 92. [Res. Lab., Child. Fund Michigan, Detroit.]

Three groups of pregnant women were investigated: (1) 109 white and 844 negro low-income hospital patients; (2) 33 white and 131 negro patients of moderate economic status who attended a hospital private clinic; and (3) 230 white private patients described as "middle-class with a few wealthy individuals". From these, 160 white and 267 negro patients were chosen to form "selected groups", representing those in whom gestation and delivery was uncomplicated and who delivered healthy term infants weighing at least 2500 g. Numerous biochemical estimations were made on blood samples. Women in groups 2 and 3 recorded qualitative 7-day food intakes early in pregnancy and at least once in each trimester, and 24-hr. "recall" records supplemented by brief dietary histories were obtained for those in group 1. The quality of diets was evaluated relative to the U.S. National Research Council recommended allowances for pregnant women by a scoring system based on average weekly helpings of 7 main food groups. The groups of patients in each race were compared in terms of median age, stature, pre-gravid weight, weight change during pregnancy and proportions in each category of diet quality and of quality of prenatal care. It was concluded that differences were unimportant except those for race, dietary quality, and quality of prenatal care. Of the diets of white patients twice as many of group 1 as of those of higher socio-economic status selected from groups 2 and 3 were classified as incompatible with full health. All the negroes, including those in the selected group, had sub-standard dietaries, comparable to those of the low-income whites in group 1. Antenatal care was also inferior for negroes, except in group 1. Birthweights in each racial group tended to rise with economic status but were not related to diet ratings or to estimated protein intakes. They were higher among women considered to have had "good" than "poor" prenatal care.

The bulk of the report is devoted to presentation of the results for blood chemistry. Median and 10th and 90th percentile levels are given, for selected group white and negro patients separately in each month of pregnancy, for the following: Hb, and serum protein, alkaline phosphatase, vitamin A, carotenoids and vitamin C. Values for infants and for non-pregnant women are compared. Median levels are also given, for each group investigated, by race and by trimester of pregnancy. Generally speaking, differences between the economic groups, where present, were inconsistent and were overshadowed by differences between races and by changes in level during the course of pregnancy. Negro levels were lower than white for Hb, and for serum vitamin A, carotenoids and vitamin C; the

reverse was true for serum protein; there was little or no racial difference in serum alkaline phosphatase. There was some evidence of a relation between serum vitamin A and vitamin C and diet ratings. Serum vitamin C levels in the selected group of whites tended to be high compared with those for white patients as a whole.

A. M. Thomson.

5105

TRÉMOLIÈRES, J., *et al.* Étude de la consommation à Marseille (mars-avril-mai 1953). [Study of consumption in Marseilles (March-April-May 1953).] *Bull. Inst. nat. Hyg., Paris*, 1954, 9, 298-340.

This study of household habits was made on 1014 randomly selected families (3331 persons) in Marseilles in the spring of 1953, but the questionnaire was not the same as that used in previous studies (Abst. 884, Vol. 21); the emphasis was on shopping habits. Nevertheless, from particulars of the foods most recently purchased certain conclusions about diet are drawn. Mean daily energy and nutrient intakes and consumption of food items are tabulated for the whole sample and for families classified in 4 economic categories. The all-over mean values were: Cal., with beverages 3048, without 2883; carbohydrate 343, animal protein 46, vegetable protein 42, fat 127 g.; Ca 1116, Fe 20 mg.; vitamin A 645, vitamin B₁ 1668, riboflavin 1774 μ g.; vitamin C 176 mg. By the criteria previously used the diets were considered adequate except in the poorest group. Fat consumption was large. Consumption of all foods except fish and dried vegetables was greater than in the 1952 inquiries, which, however, were based on a week's purchases. About a third of the housewives considered fish more economical than meat, and about the same proportion, more in the most prosperous group, considered that milk and cheese could to some extent take the place of meat. The two most prosperous groups were satisfied with their diets; in the others, meat was the item of which most wanted more. Most food is bought locally, especially in the suburbs. The weekly rhythm of shopping is shown in great detail in tables and diagrams.—W. M. Deans.

5106

BOUCHE, A. Enquête sur les budgets familiaux par carnets de comptes annuels à Marseille (octobre 1951-septembre 1952). [Study of family budgets in Marseilles by questionnaire on annual expenditure (October 1951-September 1952).] *Bull. Inst. nat. Hyg., Paris*, 1954, 9, 341-392. [Sect. Nutrit., Inst. Nat. Hyg., Marseilles.]

Sixty-six families, with 233 persons and classified in 3 occupational groups, voluntarily kept accounts

for a whole year, and these are analysed exhaustively in tables and graphs according to group and size of family. Nearly half the paper is devoted to details of expenditure on food. This formed from 43 to 53 per cent. of total expenditure and showed peaks in December and July or August. In all 3 groups meat and fish accounted for 27 per cent. of food expenditure and were as important as clothing in the total budget; next came fruit and vegetables 16 to 18, bread and cereals 13 to 15, and milk and cheese, about 10 per cent. Of the meat and fish items, most was spent on beef. The percentage spent on milk and cheese did not vary much with occupational group or size of family. Expenditure on fat, 7 to 8 per cent., was about equally divided between oil and butter and little lard or margarine was used. For the whole group the foods on which most was spent were bread, beef, wine, fresh fruit, fresh vegetables, milk, cheese, bacon and ham, oil, fresh fish, in that order.—W. M. Deans.

5107

SCRIMSHAW, N. S. Los problemas nutricionales de Centro América, con referencia especial a la República de Nicaragua. [The nutritional problems of Central America, with special reference to Nicaragua.] *Mem. IVth Congr. Méd. Nac., Nicaragua*, August 1952.

5108

CABEZAS, A. Introducción a los problemas nutricionales de El Salvador. [Introduction to the nutritional problems of El Salvador.] *Sanidad en El Salvador*, 1951, 2, 298–303.

5109

SOGANDARES, L., DE GALINDO, A. P. and MEJÍA, H. P. Estudios dietéticos de grupos urbanos y rurales de la República de El Salvador. [Diet studies on urban and rural populations in El Salvador.] *Bol. Ofic. sanit. panamer.*, 1953, Suppl. 1, 27–37. [Inst. Nutrición de Centro América y Panamá, Guatemala.]

In the rural area the wage earners were employed mostly as day labourers or overseers on coffee estates or as owner-occupiers of small holdings. A small number were employed otherwise as labourers or in commerce. About 34 per cent. of wage earners were women. Average family size was 6.6 and the total population surveyed numbered 319. About half the wage earners in the urban group were women. Average family size was 5.9 and the total population surveyed numbered 113. Food intake was measured daily for 7 days.

The rural population consumed a large amount of maize, 2340 g. per person per week, more than twice as much as the urban group, but

its consumption of meat and dairy products was low. In both populations energy intake was below the recommended level, and in the rural group intake of animal protein did not reach the minimum recommended level. Intakes of vitamins, excluding ascorbic acid which was not measured, were generally low.—P. C. Jowsey.

5110

MOEN, M. L. Consumo de alimentos de trece familias de los empleados de una fábrica de textiles en Quezaltenango, Guatemala, C.A. [Food consumption of the families of thirteen textile workers in Quezaltenango, Guatemala.] *Bol. Ofic. sanit. panamer.*, 1953, Suppl. 1, 37–49. [Inst. Nutrición de Centro América y Panamá, Guatemala.]

Of the 13 families studied, 9 with 56 persons were native Guatemalans and 4 with 23 persons were of Spanish descent. Average family size was 6. Food intake was recorded in detail for 7 consecutive days. Results are presented for Guatemalan and Spanish families separately and together.

For all 13 families, average nutrient intake per person was satisfactory, except for Ca, which averaged 0.9 g. daily, 86 per cent. of the amount recommended, and vitamin A, riboflavin and ascorbic acid, which averaged 1552 I.U., 0.8 mg. and 27 mg. daily, 35, 51 and 40 per cent., respectively, of the amounts recommended.

It is suggested that the people should be educated in the essentials of nutrition and that salt should be iodised to prevent endemic goitre.

P. C. Jowsey.

5111

INDIAN STATISTICAL INSTITUTE. The national sample survey. General report No. 1. First round: October 1950–March 1951. 2. Tables with notes on the second round April–June 1951. *Sankhyā, Indian J. Statistics*, 1953–54, 13, 47–214; 267–324.

1. In this report considerable space is devoted to general descriptions of the situation leading to this economic and social survey of India and of the methods adopted. Some of the difficulties met in planning the survey are given in the main body of the report and also, in greater detail, in the appendixes. In the first appendix the uses of the different types of form are described with the procedures adopted in sampling for different purposes. Samples of the forms used are also given in the final appendix.

The country has been divided into 6 zones, described in the first 5 tables, and the results of the survey are presented in 2 ways. First, for each zone separately, the expenditure per household over the year July 1949 to June 1950 is broken down into 42 different items of expenditure.

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[The difference in dates is explained by 2 sets of schedules having been used.] Secondly, for each of these items separately, the expenditure per household and per person is shown for the 6 zones.

A portion of the report is devoted to comments on these results, and to the development and future programme of the survey.—A. W. Boyne.

2. Selected results are given which were obtained in the period April to June 1951 in the second round of the National Sample Survey of India. This is now established on a continuing basis and conducts surveys in a number of successive rounds each year. The report is less general in its scope than that on the first round, and presents data on five main topics; a comparison of consumption patterns in the first and second rounds; the distribution of households by size of consumer expenditure; the analysis of consumption into 2 parts, that of home production and that involving monetary outlay; estimates of rural capital formation; the distribution of households by the size of lands operated or managed by them. Notes are given for each set of data to explain the concepts and definitions that were used in compiling them.—I. McDonald.

5112

WILSON, D. C. **The nutrition of schoolgirls in Northern Nigeria.** *Brit. J. Nutrition*, 1954, 8, 83-89. [Lab. Human Nutrit., Univ. Oxford.]

Girls aged 10 to 18 years in government boarding schools, in Native Authority senior and junior primary day schools and in schools of voluntary agents were examined. Records of the nutritional status of 284 subjects were made in the form described by Sinclair, "Malnutrition and Starvation in Western Netherlands", General State Printing Office, The Hague, 1948. Young Berum mothers, 24 in number, in the maternity wards of a "bush" hospital were also examined.

The dietary patterns are tabulated for the subjects arranged in 8 racial groups and in terms of 41 foods in 13 groups according to amounts used; negligible, seasonal, i.e., negligible in dry seasons, small or considerable. The mineral salts in the diet are also described. Clinical data are summarised for the dry season.

It is concluded that the nutritional status of the girls reflects the level of the agricultural economy of the community and that the intake of energy by the poorer members is low. A seasonal shortage of vitamin C may also occur.

In some mixed schools the status of the boys [number not stated] was also studied and was found to be below that of the girls. The girls ate with the women who prepared the food and so may have had more liberal amounts than did the boys.

D. Harvey.

See also Absts. 5169, 5255, 5599.

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GENERAL STUDIES: DIET PLANNING: EDUCATION

5113

COOK, P. H. and WYNDHAM, A. J. **Patterns of eating behaviour. A study of industrial workers.** *Human Relations*, 1953, 6, 141-160. [Austral. Dept. Labour Nat. Serv.]

It was desired to ascertain whether a community such as the workers in a factory has variations in the pattern of eating in accordance with the social structure and culture of groups within the community. The factory selected was owned by the Australian Government, and made and stored armaments. The staff included 39 on administration, 106 on production and 125 in the store; 95 per cent. were males, of whom 75 per cent. were married. [The date is not specifically stated but seems to have been 1950-51.] By observation, questionnaire and interviews the study investigated what was eaten, when, where and how. There was a cafeteria within the factory and no other place served meals within 10 min. walking distance.

Morning tea was taken without leaving the place of work. Luncheon was taken at midday, 40 min. for administrative staff, 30 min. for others. About 40 per cent. ate in the cafeteria, and 10 per cent. went outside the factory area. The rest ate at or near their place of work or by the water front. Well established social groups always ate in the same place. The percentage of all personnel who bought a complete meal from the cafeteria was only 18, who bought a sandwich lunch 9, and who bought something else 10. The remainder, except perhaps the 10 per cent. who left the factory precincts altogether, ate food brought from home. There seemed to be little seasonal variation in the type of food eaten in the cafeteria, and a rise in prices of 66 per cent., effected gradually, did not decrease the patronage, though an earlier and sudden rise had done so.

Economic, geographical and psychological conditions influencing especially the use or non-use of the cafeteria by the divisions of the staff are analysed in detail. The cafeteria was patronised most by the administrative staff, who had special padded seats, and least by the store staff, who worked furthest away from it and were the least skilled.

It is concluded that "no significant change in the pattern of eating behaviour of the members of this particular factory can be expected without the appropriate re-structuring of the social field". Patronage of the canteen could not be increased simply by changing menus or prices.—E. M. Hume.

5114

SCHULZ, T. **A 'human needs' diet: autumn 1953.** *Bull. Inst. Statistics Oxford*, 1953, 15, 421-435.

The cost of a "human needs" diet, which was 65s. 3d. in April 1953 (Abst. 1042, Vol. 24) had fallen to 64s. 0³d. by the autumn of that year, mainly owing to the seasonal fall in the price of vegetables. Comparison of the autumn diet with Rowntree's "human needs" diet of 1936 (Abst. 1313, Vol. 7) showed a shift in expenditure from meat to milk, and because of this and the addition of Ca to bread and flour, the 1953 diet provided 0.8 g. Ca per male adult equivalent daily, compared with about 0.5 g. in the 1936 diet; the animal protein content of the 2 diets, however, was much the same.

The idea of "human needs" is re-examined in the light of the changed situation due to derationing.

A "simple" diet is described, with less meat but more milk (some of it skimmed condensed milk instead of fresh), legumes and fat, which is claimed to supply "meals reasonably varied and appetising, as well as nutritious" for 56s. weekly, the nutrient intakes being similar to those on the "human needs" diet, except for animal protein. Finally, a diagram is given to illustrate the relation between the cost of the "simple" and "human needs" diets and average working-class incomes, and it is concluded that these diets would be within the reach even of a family on the National Assistance level.—W. M. Deans.

5115

RYER, R. (III), GROSSMAN, M. I., FRIEDEMANN, T. E., BEST, W. R., CONSOLAZIO, C. F., KUHLE, W. J., INSULL, W. (Jr.) and HATCH, F. T. **The effect of vitamin supplementation on soldiers residing in a cold environment. 1. Physical performance and response to cold exposure.** *J. Clin. Nutr.*, 1954, **2**, 97-132. [U.S. Army Med. Nutr. Lab., Denver, Colo.] Spanish summary.

Tests of endurance of cold and high physical activity were made on 86 recruits during January to March 1953 at an altitude of 8300 ft. A capsule, containing 10 mg. vitamin B₁, 10 mg. riboflavin, 100 mg. nicotinic acid, 80 mg. Ca pantothenate, 40 mg. pyridoxine, 2.5 mg. folic acid, 4 µg. vitamin B₁₂ and 300 mg. ascorbic acid, was given 4 times daily to 44 men, and a capsule containing 6 mg. ascorbic acid only to 42 men. Prescribed clothing was worn and at first food providing 4000 Cal. was allowed, but during the last 3 weeks only 2250 Cal. Tests of physical fitness were made at weekly intervals. No significant difference was found between the groups, and no effect of energy restriction could be shown in the last 3 weeks. During the period of low energy intake the effect on rectal temperature of exposure to cold was more marked in the subjects having the small supplement of ascorbic acid than

in those having the full vitamin supplement. The general physical performance of the men was not apparently affected by the energy restriction.

A. M. Copping.

5116

SCRIMSHAW, N. S. and SQUIBB, R. L. **El problema nutricional de la proteína y su relación con la agricultura. [The protein feeding problem and its relation to agriculture.]** *Bol. Ofic. sanit. panamer.*, 1953, Suppl. 1, 104-110. [Inst. Nutrición de Centro América y Panamá, Guatemala.]

5117

SEIDEL, K. **Discussion on the arrangement of certified milk for children and infants (so-called "Children's Milk").** *Acta paediat.*, 1954, **43**, 205 (with discussion 205-207). [Copenhagen.]

5118

MAYNARD, L. A. **The fortification of whole milk and skimmilk.** *J. Dairy Sci.*, 1954, **37**, 624-628. [Dept. Biochem. Nutr., Cornell Univ.] A review.

5119

HEGSTED, D. M., TRULSON, M. F. and STARE, F. J. **Role of wheat and wheat products in human nutrition.** *Physiol. Rev.*, 1954, **34**, 221-258. [Dept. Nutr., Harvard Sch. Pub. Health, Boston, Mass.]

5120

GORTER, A. **De voedingswaarde van brood. 6. De betekenis van phytine voor de voeding van de mens. [Nutritive value of bread. 6. Significance of phytin in human diet.]** *Voeding*, 1954, **15**, 145-154. [Centraal Inst. Voedingsonderzoek T.N.O., Utrecht.] English summary.

A review.

5121

DEN HARTOG, C. **Enige gedachten over een toekomstige voedingsvoorlichting. [Thoughts on future education in nutrition.]** *Voeding*, 1954, **15**, 159-168. [Voorlichtingsbur., Voedingsraad, The Hague.]

5122

FLORES, M. **Discusión sobre principios básicos y material de enseñanza sobre proteína. [Discussion on basic principles and data for teaching about protein.]** *Sanidad en El Salvador*, 1951, **2**, 316-318.

See also Abst. 4798.

FOOD ECONOMICS AND STATISTICS

5123

ALLRED, W. M. and WARD, E. H. **Costs, quality, and prices of fluid milk in rural and urban areas of Utah and Montana.** *Utah Agric. Exp. Stat. Bull.* No. 365, December 1953, pp. 40.

5124

CIANI, G. Consumo di carne e di pesce in provincia di Pescara nell'anno 1951. [The consumption of meat and fish in the province of Pescara during the year 1951.] *Zootec. Vet.*, 1954, 9, 83-96. [Univ. Perugia.]

The consumption of different kinds of meat and of all fish in each of the 46 communes of the province of Pescara in 1951 is tabulated. The mean meat consumption per head ranged in different communes from 2.18 to 19.53 kg., mean for the province 12.2 kg., and that of fish from 0.04 to 8.61 kg., mean for the province 2.5 kg. The highest consumption per head of both meat and fish was in the town of Pescara. The kind of meat principally used differed from one commune to another. When lard, bacon and offals were included pigs were the most important source of meat, but pork as such made up a smaller total than beef. In rural communes about 450 pigs were eaten as sucking pig. Forty per cent. of the pigs were killed in slaughterhouses, the rest for private use.

Of cattle, 4690 were slaughtered in the province and 90 carcasses were imported. Most of those slaughtered were between 12 and 20 months old, with fewer cows and bulls. In the town of Pescara beef consumption on the average was 10.65 kg. per head; 10 communes consumed none, and 21 others less than 200 g. per head.

Sucking lambs and kids weighing 11 or 12 kg. made up 85 per cent. of the sheep and goats killed and 57 per cent. on a liveweight basis. Only in 6 communes were adult sheep slaughtered on a large scale. In 15 communes consumption of mutton was less than 1 kg. per head.

Horseflesh was eaten only in the town of Pescara, where 316 horses were slaughtered. Other sources of meat, i.e., poultry and rabbits, provided 1.8 kg. per head over the whole province, and less than 350 g. in only 3 communes.

Only 9 communes had public slaughterhouses, 4 of recent construction, and hygiene was poor in other places. Only in Pescara was there refrigeration. There were 166 butcher's shops, one for each 1445 people, and 4 communes had none: in 40 communes fish was sold only in the open, in deplorable conditions of hygiene.

The findings are discussed in relation to the mean consumption in the whole country and to economic conditions.—D. Duncan.

5125

DEPARTMENT OF AGRICULTURE, OTTAWA, MARKET INFORMATION SECTION, MARKETING SERVICE. **Third annual poultry products market review 1953** (May 1954), pp. 80.

5126

HADDOCK, D. and MIRABAL, R. A. Preferencias del consumidor por la batata (*Ipomoea batatas*), Puerto Rico, 1950. [Consumer preference for sweet potatoes (*Ipomoea batatas*), Puerto Rico, 1950.] *Univ. Puerto Rico Estación Exp. Agric. Bol.* No. 110, May 1953, pp. 35. [Rio Piedras.] English summary.

DIET IN ETIOLOGY OF DISEASE

METHODS OF ASSESSING STATE OF HEALTH

5127

GREENBERG, B. G. and BRYAN, A. H. **Methodology in the study of physical measurements of school children. 1.** *Human Biol.*, 1951, 23, 160-179. [Univ. N. Carolina, Chapel Hill.]

Physical differences between schoolchildren with different social and economic backgrounds were investigated by measurements of age, weight, height, transverse chest diameter at the level of the xiphoid, bi-iliac diameter, and calf circumference made on boys and girls aged from 72 to 167 months. The use of these measurements to discriminate between white children from 2 schools in North Carolina which serve different socio-economic groups was examined. Data were obtained for 292 children in one school and 154 in the other.

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Means and variances for each school were calculated for each measurement for a number of different sub-groups by age. It was decided from these that the most suitable groups were those ranging from 96 to 143 months of age, because the data both for boys and for girls showed distinct and significant differences between the schools. The children in school A from urban families with higher than average incomes were, on the average, from 3 to 3.5 cm. taller and over 8 lb. heavier for their age than those in school B. The adjustments for age were made by the technique of analysis of covariance. On the basis of the variances tables are given of the estimated numbers of measurements which would be required to show certain true differences in height and weight as being significant. The other characteristics measured also showed significant differences between the

schools. The boys in school A appeared to have more muscle mass and subcutaneous fat, as judged by calf circumference, for their age and height than boys in school B, but the effect was insufficient to cause any overall difference in weight for given age and height. For girls, difference in calf circumference was significant only for the youngest, 72 to 107 months, but in this case there was an associated difference in weight even after adjustment for age and height. Neither the chest measurement nor the bi-iliac diameter was found to have any additional value in discriminating between the groups.

It was concluded that a suitable description of the physical characteristics of a group of school-children might be obtained from measurements of weight, height, and calf circumference. As a check on the conclusion, the results were subjected to multiple factor analysis, most often used with psychological data. The findings from this analysis were similar except that the measurement of height appeared to be relatively unimportant, especially for school A, bi-iliac diameter being preferred for several of the sub-groups by age and sex.

I. McDonald.

5128

EPPRIGHT, E. S., SIDWELL, V. D. and RODERUCK, C. **Relationships of nutrient levels of diets of Iowa schoolchildren to physical and biochemical measurements.** *Federation Proc.*, 1954, **13**, 456. [Nutrit. Lab., Home Econ. Res. Dept., Iowa State Coll. Ames.]

5129

ŠKERLJ, B. **Thigh girth as a means for evaluation of nutritional status.** *Human Biol.*, 1953, **25**, 28-31. [Univ. Ljubljana, Yugoslavia.]

Measurements were made during 1939-40 of 311 men of 18 to 23 and of 435 women of 17 to 23 years of age and the correlations of chest, waist and thigh circumferences with each other and with height and weight were calculated. It is concluded that thigh girth measured around the thickest part of the upper third is a simple measure of the development of the subject's soft tissues as a whole.—D. Harvey.

5130

BROŽEK, J. **Thigh girth and nutritional status : a comment.** *Human Biol.*, 1953, **25**, 159-162. [Lab. Physiol. Hyg., Univ. Minnesota, Minneapolis 14.]

In reference to Škerlj's conclusion (see previous Abst.) the thigh measurement is noted as being a complex one of bone, muscle and fat and its high correlation with weight indicates that it will add little to knowledge of the energy aspects of nutritional status.

Data from the Minnesota experiment (Abst. 6279, Vol. 20) are quoted to show that after 24 weeks on a greatly reduced energy intake deviation from the normal was greater for the circumference of the upper arm than for that of the thigh.

D. Harvey.

5131

BEHNKE, A. R. **The relation of lean body weight to metabolism and some consequent systematizations.** *Ann. New York Acad. Sci.*, 1953, **56**, 1095-1142. [Med. Res. Lab., U.S. Submarine Base, New London, Conn.]

An examination is made of the relation between body measurements and metabolism with special reference to age, height, gross weight and lean body weight (LBW) of 129 American Navy personnel and 25 professional football players. Use is also made of wellknown formulae relating metabolism to body measurements and of standard American data giving mean weights for height at age 25 years. To relate these latter to LBW, the mean percentage of fat is taken as 10 per cent. for men and 15 per cent. for women, at age 25, and is assumed to be independent of height. Estimates are made of the increasing percentages of fat with increasing age for an American population; this increase is suggested to be the reason for the fall in metabolism with ageing, found when metabolism is reported per unit of body surface area. Formulae are derived for the prediction of LBW from metabolism, first when metabolism has been calculated from age, height and weight, and second when it has been measured.

From an exhaustive comparison of formulae for the estimation of body surface area, it is concluded that, for adult males, the area is proportional to a fractional power of weight, of the order of 0.73, or, for a given stature, to a power of the order of 0.55; these findings apply also to boys if weights are related to ages. A study of metabolism formulae indicates that although the metabolic rates of men and women may differ by 10 per cent. when expressed in terms of surface area, they may actually be the same per unit of LBW, for comparable weights.

The wider significance of the work is discussed.

I. McDonald.

5132

GARN, S. M. **Fat patterning and fat intercorrelations in the adult male.** *Human Biol.*, 1954, **26**, 59-69. [Fels Res. Inst., Antioch Coll., Yellow Springs, Ohio.]

The thickness of the subcutaneous fat was measured in soft-tissue X-ray photographs of 87 white American men from 20 to 69 years old.

The thickest fat deposit measured was over the iliac crest, with an average depth of 18.9 mm. including skin. Then came the deltoid insertion, trochanteric, posterior, medial and lateral leg fat,

N.A. and R., October 1954

lateral and medial arm fat and anterior leg fat, the last only 2.7 mm. including skin. In men weighing less than 74 kg. deltoid fat was the thickest, but in men of 75 kg. or more, iliac fat was thicker. Trochanteric and medial leg fat showed the highest correlations with bodyweight ($r = +0.71$). All 9 measurements were positively and significantly intercorrelated.—D. Duncan.

5133

BERRY, W. T. C., COWIN, P. J. and DAVIES, D. R. **A relationship between body fat and plasma pseudo-cholinesterase.** *Brit. J. Nutrition*, 1954, **8**, 79–82. [Minist. Health, 23 Savile Row, London, W.1.]

The relation of surface fat to plasma cholinesterase was studied in 345 healthy males, 145 adults and groups of 86 and 114 youths in their 17th year. Surface fat was measured as skinfold thickness at 5 sites, and plasma cholinesterase was estimated from blood samples collected on filter paper. The results showed a marked positive relation between body fat and pseudo-cholinesterase, the total correlation coefficient being 0.26, which is highly significant. The relation, which held in each sub-group, was influenced to a slight extent by bodyweight but, on the evidence available for one sub-group, did not in any way depend on energy intake.—M. B. Richards.

5134

ODLAND, L. M. and OSTLE, R. J. **Serum alkaline phosphatase relationships in nutritional status evaluation of adolescents.** *Federation Proc.*, 1954, **13**, 471. [Dept. Home Econ. Res., Montana Agric. Exp. Stat., Bozeman.]

5135

SCATENA, A. R. and CULASSO, S. O. **Investigacion de algunos valores sanguineos en madres de immaduros. [Investigation of certain blood values in the mothers of premature infants.]** *Prensa pediat.*, 1953, **4**, 177–179.

Sugar, protein and cholesterol were estimated in the blood of 7 mothers of premature infants and of 4 mothers of full-term infants. The range of values for sugar and cholesterol was the same in the 2 groups. For total protein the values for the mothers of premature babies were low, ranging in g. per cent. from 5.15 to 5.80; the values for those with full-term infants ranged from 5.90 to 6.70.

E. M. Hume.

See also Absts. 4966, 5596.

GENERAL STUDIES

5136

VERROTTI, M. **Il problema del prematuro; frequenza dei parti prematuri con particolare riferimento al periodo bellico. Analisi delle**

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cause. [The problem of the premature infant: frequency of premature births especially in the war period. Analysis of causes.] *Lattante*, 1953, **24**, 449–457. [Ist. Clin. Pediat., Univ. Siena.] English summary.

The number of births registered as premature in the sense of a shortened gestation period was investigated in the commune of Siena in the 15 years 1936–50. The total number of births was 10,799, of which 588 (5.4 per cent.) were premature. The percentage was 3.8 in 1936, 3.9 in 1940, 4.8 in 1941, 5.0 in 1946, 8.9 in 1947, 8.4 in 1948, 6.9 in 1949, and 5.2 in 1950. Possible causes of the increase, including defective nutrition in the war and post-war years, are analysed.—E. M. Hume.

1537

HEWITT, D. and STEWART, A. **The Oxford Child Health Survey: a study of the influence of social and genetic factors on infant weight.** *Human Biol.*, 1952, **24**, 309–319. [Inst. Social Med., Oxford.]

Data on weight at birth and weight increase during the first year of life were analysed for 298 boys and 282 girls in the Oxford Survey. Differences in weight which were associated with parity were found to exist, the children of primiparae tending at birth to be below and at 1 year of age to be above the average for multiparae. In a study of the effect of size of parents, weights and heights of these were obtained for 424 of the babies. Parental weight had a stronger association with infant weight than did parental height; after allowance for the association of weight and height in parents the net correlations were statistically significant.

When these allowances for parity and parental size were made in addition to that for sex, estimated weight differences between groups defined by maternal efficiency, home amenities, social class and sickness experience were considerably reduced. Weight of the infant at birth was measurably affected by bad health in the mother during pregnancy, and weight at 12 months was, by these adjusted standards, less for breast- than for bottle-fed babies.

For another report from the Survey see Abst. 4970, Vol. 24.—D. Harvey.

5138

NEONOLI, A. A. M. **An enquiry into the infant mortality rate in rural areas of Unyamwezi.** *East African Med. J.*, 1954, **31**, 1–12. [Makerere Med. Sch., Uganda.]

The infant is deprived of its mother's milk for the first 2 to 7 days of life, lives in insanitary and unsuitable conditions and is exposed to malaria and other infections from birth.—L. Wills.

5139

SCHWINN, G. Untermässig-Geborene des 2. Weltkrieges. Ihre körperliche und geistige Entwicklung nach klinischer Aufzucht. [**Under-sized infants of the second world war. Their bodily and mental development after being reared in hospital.**] *Ztschr. Kinderheilk.*, 1954, **74**, 507-518. [Kinderklin., Stuttgart.]

Three hundred and sixteen children born in the period 1940-46 who in premature or multiple births had been underweight at birth and had been retained in hospital for about 2½ months until considered healthy, were examined at the age of 6 to 12 years and their bodily and mental development was compared with that of normally born children. They were on the whole of the tall lanky type, 72.8 per cent. being above normal height for their age, but on the average they were underweight for their height. Bodily development in late infancy and early childhood was not appreciably delayed beyond that of normally born children. Thirty-one per cent. showed sequelae of rickets, but marked deformities of skeletal structure were not evident. Estimation of mental development from school performance showed that 6 per cent. were mentally backward, but did not provide any definite relation between birthweight and intelligence. On the whole the results were gratifying, especially in view of the bad external conditions to which the children had been subjected *in utero*, at the time of birth, and in their early years.

M. B. Richards.

5140

SOMESWARA RAO, K., TASKAR, A. D. and RAMANATHAN, M. K. **Nutrition and haemoglobin surveys in children in Nilgiris district.** *Indian J. Med. Res.*, 1954, **42**, 55-75. [Nutrit. Res. Labs., Indian Counc. Med. Res., Coonoor, S. India.]

The results are reported of a survey of the nutritional state of 2293 children belonging to poor or lower-middle-class families. The boys were between 2 and 19 and the girls between 2 and 14 years of age as recorded in school registers. At the examination a form was completed which included measurements of height, weight and hip-width, of Hb by Wong's method (*J. Biol. Chem.*, 1928, **77**, 409) with colour comparison in a photo-electric colorimeter, and, in 1084 of the children, of the thickness of subcutaneous tissue at 5 sites. General appearance was assessed by 4 grades, good, fair, poor or very poor, on the basis of height and weight as measured, on amount of subcutaneous tissue and musculature as judged by inspection, on the condition of the skin and mucous membrane, and on the posture and alertness of the child. Other clinical assessments made referred to the conditions of the eyes, mouth, hair and skin, and bones and to the heart size.

Average body measurements and Hb value, with standard deviations are tabulated for the sexes at yearly intervals of age. When allowance was made for the difference in method of recording age no appreciable variation in heights or weights from the findings in an earlier study by Aykroyd and Rajagopal (Abst. 5494, Vol. 6) was noted. As they approached puberty girls lagged behind boys in Hb and, from the fourth year upwards, the Hb of these Indian children was lower than that of British children by amounts which, on the average, were between 0.5 and 2.0 g. per 100 ml. blood.

The incidences are tabulated of 11 signs for sexes and of 10 signs for age. A sex difference was especially noticeable in the greater incidence among boys of folliculosis, defined as "mild perifollicular prominences without keratotic plugs". Xerosis and Bitôt's spots were most frequent between 2 and 5 years; folliculosis was spread almost uniformly over the ages 5 to 15 years; nutritional oedema was seldom seen after 5 years of age but, because of admissions to hospital, the number of cases seen did not accurately measure the incidence of the disease.

The suitability for survey work of the schedule which was followed is discussed and modifications to exclude certain non-nutritional signs, such as "conjunctival folliculosis" [from the Key on p. 73, this appears to be folliculosis of the eye lids] and pigmentation, pyorrhoea and purulent conjunctivitis and to include others of possible nutritional significance, such as cheilosis or koilonychia, are proposed.—D. Harvey.

5141

SZCZYGIŁŁA, A., WOŹNIAK-TORBIĆKA, E., BERGER, S., SZCZYGIŁŁOWA, M., RUDOWSKA-KOPROWSKA, J. and SZKIEŁACZKOŹA, W. Sposób odżywiania się a stan odżywienia wybranej grupy młodzieży. [**Nutrition and nutritional status of a group of young people.**] *Rocz. Państwowego Zakł. Hig.*, 1954, **5**, 1-14. [Z Działu Hig. Żywnienia PZH.] Russian and English summaries.

In a survey made in a state boarding school in the Warsaw district the children were found to be well nourished. Values for nutrients obtained by chemical analysis of the diet tended to be below those calculated from analytical tables, especially for vitamin C. Hb and serum protein were within normal limits but blood carotene was below normal; blood and urinary ascorbic acid values also were subnormal. Suspected clinical signs of vitamin deficiency were found in the following percentages of those examined: vitamin A 1, vitamin C 2, riboflavin 4 and nicotinic acid 8. (From summary.)—D. Harvey.

5142

DUGUID, J. B. **Diet and coronary disease.** *Lancet*, 1954, **266**, 891-895. [Dept. Pathol., Univ. Durham.]

In a general article the morphology, experimental production and etiology of atherosclerosis are discussed, with special reference to experimental cholesterol sclerosis. It is pointed out that there are 2 different forms of atherosclerosis, one arising from mural thrombosis and associated with narrowing of the arteries, the other arising from the deposition of lipids or lipid-bearing cells on the intima and associated with dilatation of the arteries. Either may occur in human subjects, but only the former is important in coronary disease. The evidence of a relation between diet and atherosclerosis in man is discussed. To cause lesions in experimental animals, far more cholesterol is needed than is likely to occur in human diets and the type of change produced is that associated with dilatation. The fatty changes found in the coronary and other arteries may be related to diet, but a direct connection between thrombosis and these changes cannot be demonstrated.—L. Wills.

5143

GOFMAN, J. W., TAMPLIN, A. and STRISOWER, B. **Relation of fat and caloric intake to atherosclerosis.** *J. Amer. Dietetic Assoc.*, 1954, **30**, 317-326. [Donner Lab., Div. Med. Phys., Univ. California, Berkeley.]

In this discussion, based mainly on the authors' published work (see Absts. 686, Vol. 20; 2071, Vol. 21), it is pointed out that no direct measure is available for assessing the degree of atherosclerosis or its rate of development in man. It is assumed for the purposes of the discussion that the tendency of an individual to develop clinical coronary heart disease, termed "coronariness", is directly related to coronary atherogenic potentialities. The best measure of coronariness, obtainable from ultracentrifuging of lipoproteins, is represented by the Atherogenic Index, or A.I. value, given by $(\text{Standard } S_1 0-12 + 1.75 \text{ Standard } S_1 12-400) \div 10$, the Standard S_1 values being in mg. per 100 ml. The probability of developing coronary heart disease rises with increasing A.I. value. Further, high A.I. values are associated with overweight. There is some evidence that raised A.I. values in obese persons may, at least in part, be the result of excessive intake of fat. There is no valid evidence that calories *per se* in a person not losing or gaining weight affect lipoproteins or A.I. values. The possibility that a metabolic disturbance associated with obesity itself leads to raised A.I. values has not been evaluated.

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Correction of overweight is likely to be of prophylactic value in obese subjects with high A.I. values, but may have little therapeutic value in established coronary disease.—F. C. Aitken.

5144

SHUMAN, C. R. and WOHL, M. G. **Nutritional aspects of heart failure.** *J. Clin. Nutrit.*, 1954, **2**, 5-10. [Nutrit. Project, Philadelphia Gen. Hosp.] Spanish summary.

5145

BERG, H. H. **Thrombo-Embolie und Diätetik. Bemerkungen im Rahmen des Panorama-wandels innerer Krankheiten. [Thrombo-embolism and diet. Remarks in the framework of the changing panorama of internal disease.]** *Deutsch. med. Wochenschr.*, 1954, **79**, 801-803. [I. Med. Klin., Univ. Hamburg, Eppendorf.] A lecture review.

5146

BRAS, G., JELLIFFE, D. B. and STUART, K. L. **Veno-occlusive disease of liver with non-portal type of cirrhosis, occurring in Jamaica.** *Arch. Pathol.*, 1954, **57**, 285-300. [Dept. Pathol., Univ. Coll. West Indies.] Etiology uncertain, but ascribed to "bush tea" and poor diet.

5147

SCHETTLER, G. **Ist der sogenannte Greisenbogen der Hornhaut ein Hinweis auf Atherosklerose? [Is so called arcus senilis of the cornea a sign of atherosclerosis?]** *Deutsch. med. Wochenschr.*, 1954, **79**, 915-917. [Med. Klin., Univ. Marburg a.d. Lahn.]

Analysis of the records of 3000 general hospital cases showed that *Arcus lipoides corneae* seldom appeared before the age of 40, that its frequency increased with age, and that it occurred more frequently in men than in women. In patients with definite atherosclerosis it was more frequent than in controls free from vascular disease. From a study of tables showing the frequency of atherosclerosis in persons with and without *Arcus lipoides corneae* it appears that if it is present in men of the age groups 40 to 49, 50 to 59 or 60 to 69, or in women of the group 50 to 59, there is a strong probability of atherosclerosis. *Arcus lipoides corneae* consists predominantly of lipids, chiefly cholesterol, but increase of blood cholesterol cannot be the sole cause of its formation, for the distinct increase of its frequency after the age of 60 is accompanied not by an increase but more often by a decrease of blood cholesterol. In the development of atherosclerosis and also of *Arcus lipoides corneae* some local factor must be concerned.—M. B. Richards.

5148

BERRY, W. T. C. **Myotatic irritability.** *Brit. J. Nutrition*, 1954, **8**, 165-170. [Minist. Health, 23 Savile Row, London, W.1.]

Muscle irritability, shown by local contraction in response to firm tactile stimulation, was found in undernutrition and decreased with abundant feeding (Abst. 1187, Vol. 18). This was re-investigated in 105 men examined in Berlin during the Russian blockade in January and March 1949, and again in October after the food situation had improved (see Abst. 4013, Vol. 21).

Muscle irritability was negatively related to the amount of body fat and was less in October than in the earlier tests. Treatment of 8 subjects with vitamin B₁ did not consistently reduce muscle irritability, in contrast to the report of Taylor and Chhuttani (Abst. 5394, Vol. 19). The sign persisted in 4 curarised subjects and was increased in 3 of them.

It is suggested that flaccidity and the degree to which the muscle can be compressed by the pinch determine the extent of the response. Under-nutrition, vitamin B₁ deficiency and curarisation all lead to soft, easily compressed muscles.

D. Duncan.

5149

SÉRANE, J. and BONNIOT, R. Étude clinique de 136 cas de goutte masculine. [Clinical study of 136 cases of gout in men.] *Presse méd.*, 1954, **62**, 507-508. [Vittel.]

5150

WENDEROTH, H. Kritische Betrachtungen über das Hämosideroseproblem. [Critical considerations on the haemosiderosis problem.] *Deutsch. med. Wochenschr.*, 1954, **79**, 572-574. [I. Med. Klin., Univ. Hamburg., Eppendorf.]

5151

PENNINGTON, A. W. **Pathophysiology of obesity.** *Amer. J. Digest. Dis.*, 1954, **21**, 69-73. [Med. Div., E.I. du Pont de Nemours and Co., Wilmington, Del.]

5152

HAGAN, T. L., PASTERNAK, M. and SCHOLZ, G. C. **Waterborne fluorides and mortality.** *Pub. Health Rep., Washington*, 1954, **69**, 450-454. [Div. Dent. Pub. Health, Bur. State Serv., Pub. Health Serv.]

The prevalence of 5 groups of diseases in relation to exposure to F was studied by examination of the adjusted mortality rates in 32 pairs of cities with populations of 10,000 or more in 16 States. In one of each pair, the fluoride city, the F content of the water supply was above 0.70 p.p.m. and in the other, the non-fluoride city, it was below 0.25

p.p.m. Populations in the fluoride cities totalled 892,600 and in the non-fluoride 1,297,500. Geographically the cities were paired as near each other as possible.

Average mortality rates per 100,000 population for fluoride and non-fluoride cities, respectively, were heart disease 354.8 and 357.4, cancer 135.4 and 139.1, intracranial lesions 111.5 and 104.8, nephritis 21.9 and 26.9, cirrhosis of liver 6.6 and 8.2, all causes 1010.6 and 1005.0. The differences between the rates for fluoride and non-fluoride cities were not statistically significant.

Of the 32 pairs of cities the numbers of occasions in which the incidence of the particular disease was higher in the fluoride than in the non-fluoride city were: heart disease 15, cancer 16, intracranial lesions 19, nephritis 13, liver cirrhosis 15.

D. Harvey.

5153

McKINLAY, P. L. **Social class differences of maternal mortality in Scotland.** *Health Bull., Dept. Health Scot.*, 1954, **12**, 29-31.

See also Abst. 4939.

DEFICIENCY DISEASES

General

5154

SODEMAN, W. A. and MUKHERJI, K. L. **Observations on malnourished patients.** *Amer. J. Med.*, 1954, **16**, 610. *Proc. [Sch. Med., Univ. Missouri, Columbia.]*

5155

MONNEROT-DUMAINE, M. La terminologie du kwashiorkor. [Terminology of kwashiorkor.] *Bull. Soc. Pathol. exot.*, 1953, **46**, 974-976.

The other names for the syndrome called kwashiorkor by Cicely Williams are discussed and that preferred is *stéato-cirrhose carentielle du sevrage* (deficiency steatocirrhosis of weaning).

E. M. Hume.

5156

MONNEROT-DUMAINE, M. Le kwashiorkor (stéato-cirrhose carentielle du sevrage). [Kwashiorkor (deficiency steatocirrhosis of weaning).] *Presse méd.*, 1954, **62**, 545-546. [Port Said.] A descriptive article.

5157

GELFAND, M. **Kwashiorkor. A description of a case in a breast-fed infant.** *S. African Med. J.*, 1954, **28**, 185-186. [Salisbury Native Hosp., S. Rhodesia.]

Clinical data are given of the occurrence of kwashiorkor in a third child on the breast; 2 earlier cases have been reported by the author (see Absts. 4744, Vol. 16; 1124, Vol. 22). The evidence

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of the child's mother was that while breast-feeding her milk flow had been adequate.

The protein deficiency theory of the cause of the disease is briefly discussed. Deficiency of B group vitamins or interference with absorption of these by toxins in maize and other cereals are other possible causes, further study of which is advocated.—D. Harvey.

5158

THOMSON, F. A. **Notes on kwashiorkor in Malaya.** *Trans. Roy. Soc. Trop. Med. Hyg.*, 1954, **48**, 150-152.

In the district of Perak kwashiorkor is the cause of severe chronic ill-health rather than of acute illness. The clinical records of 100 children are summarised; 77 were between 18 months and 4 years of age, the extremes being 3 months and 5 years. The children affected were 84 Malays, 14 Chinese and 2 Indians in a district where the population, per cent., was 12 Malay, 68 Chinese and 20 Indian. Indians use some cow's milk, Chinese little milk but eggs occasionally and fish in fair quantity, Malays little but rice. A taste exists for sweetened powdered or evaporated milk and there is a real need for such foods to be made available in the shops.—D. Harvey.

5159

CHARMOT, G., LINHARD, J., GIUDICELLI, P. and TRAPET, P. **Intérêt clinique des perturbations de l'équilibre protidique en pathologie tropicale. Considérations sur la "dysprotéïnémie africaine". [Clinical significance in tropical pathology of disturbances of protein equilibrium. "African dysproteinaemia".]** *Méd. trop.*, 1953, **13**, 961-976. [Corps de Santé Colonial, Hôp. Coloniaux.]

The methods used are described, and their usefulness and significance are discussed; previous results with the same methods are quoted. A detailed report is given of the results of paper electrophoretic studies, and of 5 flocculation tests, made on serum from healthy and sick Europeans and Africans living in Dakar. For both races, troops living in barracks under similar conditions were taken as normals.

In the African compared with the European, the values for serum proteins, like those of other workers, showed a moderate excess of total proteins with a moderately low albumin fraction, and a marked excess in the γ -globulin fraction, but in 20 per cent. of the 103 Africans examined the values were the same as for the Europeans. In 56 healthy Africans the 5 flocculation tests gave normal results in 12 subjects only; in the remainder the results were abnormal in one or more tests.

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The results of similar examinations in patients of both races suffering from jaundice, cirrhosis, fatty liver or amoebic hepatitis are reported in detail; the differences between the races in the results obtained are discussed and the need to make allowance for the initial difference between the serum protein patterns is stressed. From the results it is concluded that necrotic lesions of the liver are associated with high α -globulin and an increase in the intensity of the positive reaction to the plasma formol gel test, that parenchymatous liver lesions are associated with high β -globulin and with a positive reaction to the MacLagan test, and that mesenchymal liver lesions lead to an increase in γ -globulin and a strongly positive reaction to the serum formol gel test.

The results of liver biopsies in 35 Africans with no sign of liver disease are quoted. In 13 of the biopsies the material appeared normal, in 3 there was evidence of a latent precirrhotic condition and in 20 there was some pathological change in the mesenchymal tissue. The intensity of the histological changes was reflected in alteration of the serum protein equilibrium, especially increase in γ -globulin as shown by electrophoresis or the serum formol gel test.—L. Wills.

5160

JACKSON, J. H. **A deficient diet constituted mainly of maize: a discussion of its effects with particular reference to the eye and the lungs.** *African Med. J.*, 1954, **28**, 305-308. [Arusha, Tanganyika Territory.]

The nutritional diseases, kerato-conjunctivitis and pulmonary oedema, in Africans whose diets are based on maize are described and discussed on the basis of the author's experience in the Transkei. D. Harvey.

5161

BERESTON, E. S. **Vitamins in dermatology.** *J. Clin. Nutr.*, 1954, **2**, 133-139. [Dept. Dermatol., Sch. Med., Univ. Maryland, Baltimore.] Spanish summary.

A review.

5162

MARQUES, R. J. **Dermatosis carenciales en cirróticos. [Deficiency dermatitis in cirrhosis of the liver.]** *Rev. española Enferm. Apar. digest. Nutricion*, 1954, **13**, 122-129. [Fac. Cienc. Méd., Pernambuco.] English summary.

Skin lesions resembling those described in pellagra or vitamin A deficiency were observed in 76 per cent. of patients with cirrhosis of the liver, but were rare in other patients from the same environment. Xerosis, hyperkeratosis and glossitis were the most frequent lesions. The feet, legs and elbows were the most common sites for pigmented

dermatosis. Histological study of some skin specimens showed changes resembling those found in vitamin deficiencies. The problem of secondary deficiency in cirrhosis is very briefly discussed.

A. M. Copping.

5163

MARTÍNEZ PÉREZ, F. Acrodinia. Consideraciones etiopathogenicas y terapeuticas. [**Acrodynia. Etiopathology and treatment.** *Rev. española Pediat.*, 1954, **10**, 27-39. [Elda, Alicante.] French, English and German summaries.

Three cases of acrodynia are described which lacked some of the signs considered essential for this condition; such incomplete cases may occur with considerable frequency. One patient showed an excellent response to treatment with BAL (British antilewisite), the antidote for heavy metal poisoning. ACTH and cortisone are recommended for cases that have proved resistant to vitamin B₆ and the other usual treatments. The recognised signs of acrodynia, its pathology and treatment, and the theories of its etiology are discussed.

M. B. Richards.

5164

GOULD, J. The use of vitamins in psychiatric practice. (Abridged.) *Proc. Roy. Soc. Med.*, 1954, **47**, 215-220. [Broadmoor.]

5165

PETERMAN, R. A. and GOODHART, R. S. Current status of vitamin therapy in nervous and mental disease. *J. Clin. Nutr.*, 1954, **2**, 11-21. [Washington Heights Nutrit. Clin., Bur. Nutrit., New York City Dept. Health.] Spanish summary.

5166

FLINK, E. B., STUTZMAN, F. L., ANDERSON, A. R., KONIG, T. and FRASER, R. Magnesium deficiency after prolonged parenteral fluid administration and after chronic alcoholism complicated by delirium tremens. *J. Lab. Clin. Med.*, 1954, **43**, 169-183. [Dept. Med., Univ. Minnesota, Minneapolis.]

A non-alcoholic woman given parenteral fluids on account of persistent vomiting developed twitching, gross muscle tremor and choreiform movements, could not talk or eat and appeared to be delirious and disoriented. She was found to have low serum Mg (1.19 m. equiv. per litre). Prompt improvement followed administration of Mg by intramuscular injection of magnesium sulphate solution.

Thirteen chronic alcoholics with tremor and 17 with mild or severe delirium as well, all said to have a bad dietary history [no details] had low serum Mg values, mean 1.40 ± 0.24 compared with 1.91 ± 0.20 m. equiv. per litre in normal

persons, and the worse their condition, the lower the serum Mg. In 20 of 23 treated, good results followed intramuscular injections of a 50 per cent. magnesium sulphate solution, improvement generally being manifest in 24 hr. or less. The amount recommended is 2 g. MgSO₄·7H₂O four times daily for 3 days; then, if needed, 1 g. four times daily for 2 to 4 days more. Case histories are given.

The results are discussed with reference to the literature on Mg deficiency in animals and the possibility of its occurrence in man. It is concluded that Mg deficiency occurs in man more commonly than is generally supposed. Among them, the patients exhibited all the signs observed in Mg-deficient animals, although a single individual might exhibit only a few.—W. M. Deans.

5167

MÄRTENS, S. Alkoholism och leversjukdom. [**Alcohol addiction and liver disease.** *Nord. Med.*, 1954, **51**, 439-444. [Beckomberga Sjukhus, Bromma, Sweden.] English summary.

A review.

5168

JELLIFFE, D. B. *Ascaris lumbricoides* and malnutrition in tropical children. *Doc. Med. geogr. trop.*, 1953, **5**, 314-320. [Dept. Med., Univ. Coll. W. Indies, Jamaica.]

The nutritional physiology of the roundworm is discussed. The literature shows that in the gut the parasite metabolises 1.4 g. carbohydrate and 0.35 g. protein daily per 100 g. undried parasite, and absorbs and metabolises not only protein, fat and carbohydrate but also vitamins, particularly those of the B complex. A Jamaican child of 4 years, heavily infested with worms, was underdeveloped and underweight and complained of abdominal discomfort. Treatment resulted in the expulsion of 120 adult worms weighing 200 g., and was followed by gain in weight and improvement in amino-acid absorption compared with the values before treatment. The serum proteins rose in 14 days from 5.6 to 6.8 g. per 100 ml.—L. Wills.

See also Absts. 4741, 4833, 5115.

Vitamin A

5169

SOMESWARA RAO, K., DE, N. K. and SUBBA RAO, D. Investigation of an outbreak of night-blindness in a village near Madras. *Indian J. Med. Res.*, 1953, **41**, 349-357. [Nutrit. Res. Labs., Indian Counc. Med. Res., Coonoor, S. India.]

The village was 16 miles west of Madras; data were obtained also from a nearby village where no case of night blindness was reported. The inhabitants of both villages were extremely poor and

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illiterate. Cholum (*Sorghum vulgare*) was the main cereal consumed; flesh food and dairy products were not eaten. The diets were deficient in many respects and the average daily Calorie intake was only 1000 per consumption unit. The vitamin A potency of the diet, which was derived chiefly from carotene, was 2600 I.U. daily in families complaining of night blindness, and was actually lower, 1030 I.U., in families with no case of night blindness and not showing evidence of impaired capacity for dark adaptation.

Evaluation of nutritional status included measurement of the capacity for dark adaptation, concentration of Hb and degree of intestinal infestation in 207 people from the first village and 115 from the second. Incidence of anaemia in the first village was high, 34 per cent. having Hb values under 10 g. per 100 ml., compared with 14.8 per cent. in the second village. Impairment of capacity for dark adaptation was associated with the recurrence of anaemia.

In a therapeutic trial 71 patients with impaired capacity for dark adaptation were divided into 3 groups, which received daily from 130 to 260 mg. ferrous Fe, or 1 ml. shark liver oil containing 12,000 I.U. vitamin A, or a placebo. In addition all subjects received supplements to the diet. Considerable improvement in dark adaptation occurred in all groups, the average percentage showing improvement being 83, 100 and 73, respectively.—I. M. Sharman.

5170

ROHMER, A., MICHEL, M., HAARSCHER, A. and LOBSTEIN, A. Deux cas de xérophtalmie chez des nourrissons atteints de dysfonction hépatique, avec lithiase urinaire chez l'un d'eux. Les problèmes de l'avitaminose A. [Two cases of xerophthalmia in infants with disorders of liver function, one of them having urinary calculi. Problems of vitamin A deficiency.] *Pédiatrie*, 1954, 9, 33-39. [Inst. Puériculture Dr. Schneegans.]

Two babies, one of 4 months and one of 3 months, were admitted to hospital with jaundice, in treatment of which they were given skimmed milk.

After about 2 months one was found to have advanced keratomalacia of the right eye. It was given 2 injections of vitamin A but died within a week.

The second child showed early signs of xerophthalmia after 8 days' treatment with partly skimmed milk; it had already received 2 injections of vitamin A when the eye condition was noticed. The eyes improved but 2 months later it developed pyelitis, and passed a number of stones in the urine. It gradually recovered.

It is recommended as routine to give vitamin A to all infants with jaundice.—E. M. Hume.

5171

CROOK, E. M. and EL-MARSAFY, M. K. Association of carotene with serum proteins. *Biochem. J.*, 1954, 57, viii. [Dept. Biochem., University Coll., London.]

5172

LAHIRI, K. D. and SCANDRETT, F. J. Low blood vitamin-A levels in dermatology. *Indian Med. Gaz.*, 1954, 89, 31-32. [Med. Coll., Calcutta.]

Vitamin A and carotene were estimated in the blood of patients suffering from skin diseases and in normal healthy subjects. Average values for vitamin A in the blood serum of 9 subjects with ichthyosis and of 15 with nummular eczema were only 131.0 and 115.6 I.U. per 100 ml., respectively, compared with 187.0 for 114 healthy persons. Corresponding values for carotene were 73.3, 59.0 and 69.0 I.U. per 100 ml. Estimations were made also for 16 patients with Besnier's prurigo, 7 with neurodermatitis and 7 with alopecia areata, but the values were within the normal range, the average values being 195.0, 190.0 and 175.0 I.U. vitamin A per 100 ml., respectively. It is claimed that the results provide a basis for relating the lesion in ichthyosis and nummular eczema to deficiency of vitamin A.—I. M. Sharman.

5173

LAHIRI, K. D. and SCANDRETT, F. J. Vitamin A in acne vulgaris. *J. Indian Med. Assoc.*, 1954, 23, 247-249. [Dept. Med. Skin. Dis., Med. Coll., Calcutta.]

Seventy-five patients with acne, who had not previously responded to other forms of treatment, were given 100,000 I.U. vitamin A daily by mouth. Of 30 in whom the principal lesion consisted of papules and pustules on the face, with comedones and oiliness, all were cured after 2½ months. Twenty others with the lesions on the back and face, and 10 with lesions on the face and chest, were completely cured after treatment for 3 months. Ten with cysts healed after 5½ months. The five remaining very resistant patients had cysts; they had been previously treated by routine methods for 4 years and relapsed from 3 to 4 times yearly, but were cured after treatment for 6 months with vitamin A. No evidence of toxicity was seen.

Estimations of carotene and vitamin A in the blood of acne patients not given vitamin A gave average values of 59.4 and 175.1 [presumably I.U. per 100 ml.]. Corresponding values for normal males are reported as 65.7 and 200.3 and for normal females as 71.6 and 174.7, respectively. Serum vitamin A values in the normal subjects rose to a value about three times the fasting value 6 hr. after a test dose of 100,000 I.U. vitamin A, and returned to about the original fasting value

after 24 hr. In the acne patients the peak values were reached also in 6 hr., but the rise was much smaller. The subsequent decline in the acne patients was much slower than in the normal subjects.

The excretion of 17-ketosteroids in the urine was measured in 2 of the male acne patients and was found to fall from about 30 mg. daily before treatment to about 10 mg. daily after 6 months' treatment with vitamin A. It is suggested that presence of acne is probably related to the patient's endocrine status by which defective utilisation of vitamin A may be promoted.—I. M. Sharman.

5174

KLEINE, H. O. Vitamin-A-Therapie bei prämenstruellen nervösen Beschwerden. [**Vitamin A treatment of premenstrual nervous disturbances.**] *Deutsch. med. Wochenschr.*, 1954, **79**, 879-880. [Städt. Frauenklin., Ludwigshafen a. Rh.]

In 100 patients with premenstrual nervous disturbances, as shown by irritability, quarrelsomeness, emotional instability and anxiety, daily doses of 50,000 I.U. vitamin A, given during the second half of the menstrual cycle, were often beneficial. The vitamin is thought to act by counteracting the action of thyroxine produced under the influence of progesterone.—T. Moore.

5175

SCHNEIDER, E. Vitamin C und A beim Karzinom. Ein Beitrag zur Hypervitaminisierungstherapie der Krebskranken. [**Vitamins C and A in carcinoma. The treatment of cancer patients by excess of vitamins.**] *Deutsch. med. Wochenschr.*, 1954, **79**, 584-586.

A report is made on an uncontrolled series of cases treated with vitamins A and C.

Vitamin E

5176

STURM, W. Zur Behandlung deformierender Gelenkerkrankungen mit Tokopherol. [**Treatment of deforming joint diseases with tocopherol.**] *Ztschr. ges. inn. Med.*, 1953, **8**, 1138-1141. [Inn. Abt., Krankenhaus Küchwald, Karl Marx-Stadt.]

The joint-deformities studied were of the rheumatoid type, defined as collagenoses. Patients were selected in whom the process had not existed for more than 2 years. They were treated for at least 6 weeks with 100 mg. mixed tocopherols from wheat germ oil (Tokopharm-forde, Pharmasan), given orally 3 times a day. Local treatment to promote hyperaemia in affected joints was part of the treatment. Observations have been

made for 2 years, and the results are considered favourable for the use of tocopherol as an auxiliary treatment. No quantitative report is made.

E. M. Hume.

5177

DAHL, O. **The treatment of plastic induration of the penis (Peyronie's disease).** *Acta radiol.*, 1954, **41**, 290-301. [Radiumhemmet, Stockholm.] German and French summaries.

Eighteen patients aged from 20 to 70 years, with induration of the penis, were treated with 300 mg. tocopherol daily for several months. Pain on erection was cured in 6, and decreased in 4, of the 13 patients who originally had this symptom. Penile curvature was cured in 2 and decreased in 4 out of 17 patients. Penile plaques, which were seen in all the patients, disappeared in 3 and decreased in 7. Experience had shown that in the absence of treatment the lesions did not improve. About the same degree of success was obtained in a larger group of patients who were treated with radium. A few who had failed to respond to radium were improved by tocopherol. The results obtained by giving vitamin E to 22 patients with Dupuytren's contracture of the hand, which sometimes accompanies induration of the penis, were not encouraging.—T. Moore.

5178

ANT, M. **Diabetic vulvovaginitis treated with vitamin E suppositories.** *Amer. J. Obstet. Gynecol.*, 1954, **67**, 407-410. [Brooklyn, N.Y.]

Vitamin B Complex

5179

STEGER, J. Der polyneuritische Symptomen-Komplex und seine Behandlung. [**The polyneuritis symptom complex and its treatment.**] *Deutsch. med. Wochenschr.*, 1954, **79**, 580-582. [Neurol. Klin., Univ. Würzburg.]

A short general article.

5180

MEYER, F. L'influence de l'aneurine-pyrophosphate sur le taux d'acide pyruvique dans le sang. [**Effect of vitamin B₁ pyrophosphate on the blood pyruvic acid value.**] *C.R. Soc. Biol.*, 1953, **147**, 1901-1903. [Hôp. de la Pitié, Paris.]

Diabetic subjects whose diet provided 2500 Cal. daily fasted for 14 hr. and then received 12 units of insulin intravenously. Blood sugar and pyruvic acid were estimated at half-hour intervals for 4 hr. The procedure was repeated on the third day, while on the second and fourth the subjects received their usual treatment. On the fifth day procedure was as for the first day except that 1 hr. after injection of insulin, 150 mg. vitamin B₁

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pyrophosphate in 5 ml. buffer at pH 7.3 were given intravenously.

The blood pyruvic acid value ranged normally from 0.5 to 1.1 mg. per 100 ml. In the 2 hr. after injection of insulin it rose. The increase was not diminished by administration of vitamin B₁ pyrophosphate and in some subjects it was increased. It is concluded that the blood sugar value and its response to insulin are not related to the pyruvic acid value.—V. R. Jackson.

5181

BARBIERI, L. L., FRANCO, T. and PARENTI, G. Azione della cocarbossilasi sull'elettrocardiogramma e sulla tachicardia da sforzo. [Effect of cocarboxylase on the electrocardiogram and on tachycardia of effort.] *Acta vitaminol.*, 1954, 8, 65-72. [Ist. Clin. Med. Terap. Med., Univ. Bologna.] French, English, German and Spanish summaries.

An electrocardiogram was taken from 10 healthy young persons and from 10 with valvular heart disease, moderately well compensated, when at rest and after an exercise test with ascent and descent of 2 steps. The test was made with and without previous intravenous administration of 50 mg. cocarboxylase. The most important result was that administration of cocarboxylase reduced the mean pulse rate especially after exercise in both sets of subjects, though this was not true for every individual. The mean value for the QT interval was reduced after exercise in the heart patients unless cocarboxylase was given; in the normal subjects there was no effect. The RS and T voltages were increased after exercise when cocarboxylase had been given.—E. M. Hume.

5182

SOLOV'eva, E. J. and CHRUSTAL'eva, V. P. Nekotorye dannye o soderzhanii tiamina v zhenskoi moloke. [Some values for the vitamin B₁ content of human milk.] *Vop. Pitan.*, 1954, 13, No. 2, 16-20. [Gosud. Kontrol. Vitamin. Stants., Minist. Zdravoochran. SSR, Moscow.]

In specimens of breast milk from 37 women, vitamin B₁ was estimated by the thiochrome method after enzymic hydrolysis. The investigations were continued for a year in view of the possibility of seasonal change. The average for the whole period was 21.99 ± 0.48 μ g. per cent. with the majority of values between 18 and 25 μ g. Specimens analysed during the autumn gave an average significantly higher than at other seasons. The values are above many found in the literature; the criteria of normality in this respect are inadequately established. Some conditions which may modify the vitamin B₁ requirement of the infant are discussed.—D. W. Taylor.

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5183

CITRON, K. M. and KNOX, R. The uptake of thiamine by a strain of *Staphylococcus aureus* from the duodenum of a case of polyneuritis. *J. Gen. Microbiol.*, 1954, 10, 482-490. [Dept. Bacteriol., Guy's Hosp. Med. Sch., London.]

A strain of *Staphylococcus aureus* was obtained from an elderly polyneuritic patient with steatorrhoea, achlorhydria and macrocytic anaemia, and with deranged pyruvic acid metabolism suggestive of vitamin B₁ deficiency.

The organism was shown to remove vitamin B₁ from culture solution, or to destroy it, and strains of Oxford staphylococcus, *Bacterium coli* and *Proteus vulgaris* were found having the same capacity. It is suggested that a heavy infection might cause clinical deficiency.—V. R. Jackson.

5184

GOLDSMITH, G. A., GIBBENS, J., ROSENTHAL, H. L., UNGLAUB, W. G. and MILLER, O. N. Comparative effects of diets containing lime-treated and untreated corn in production of human niacin deficiency. *Federation Proc.*, 1954, 13, 458-459. [Dept. Med., Tulane Univ. Sch. Med., New Orleans, La.]

5185

KOTHE, M. and SCHÖGER, G. A. Der Einfluss von Nikotinsäure auf die periphere Durchblutung. [Effect of nicotinic acid on the peripheral circulation.] *Deutsch. med. Wochenschr.*, 1954, 79, 503-505. [Staatl. Sanatorium Römerbad, Schlangenbad, Ts.]

In 2 series of experiments in which 2 different thermo-electric methods of measuring skin temperatures were used, the intravenous administration of 0.05 g. of the Na salt of nicotinic acid had no appreciable effect on the skin temperature of 3 control subjects but raised it in 9 out of 11 proven cases of *brachialgia paraesthetica nocturna*. The rise was greatest in the arms but was definite in the legs and less on the forehead; rectal temperature was not significantly altered.—L. Wills.

5186

MUDIE, I. S., HORNE, N. W. and CROFTON, J. W. Isoniazid and weight gain. A pilot investigation. *Brit. Med. J.*, 1954, i, 1304-1305. [Dept. Tuberculosis Dis. Chest, Univ. Edinburgh.]

5187

MCCARTHY, F. P. and MCCARTHY, P. L. Diseases of the mouth. A statistical review of 4728 patients. *New Engl. J. Med.*, 1954, 250, 493-498. [Tufts Coll. Dent. Sch., Boston, Mass.]

The study covered 4728 patients with 5207 lesions and showed that tongue lesions were more

common than any other form. Lesions due to pellagra or other vitamin deficiency were very rare.

L. Wills.

5188

JIMÉNEZ DÍAZ, C., ALÉS, J. M. and VIVANCO, F. La acción simbiótica de la flora microbiana intestinal. (Estudios sobre la síntesis de ácido nicotínico, piridoxina, ácido fólico y vitamina B₁₂ por la flora microbiana entérica.) [The symbiotic action of the intestinal microbial flora. Studies on the synthesis of nicotinic acid, pyridoxine, folic acid and vitamin B₁₂ by the intestinal microbial flora.] *Rev. clín. española*, 1953, **51**, 294-305. [Inst. Invest. Méd., Univ. Madrid.] English, German and French summaries.

Nicotinic acid, pyridoxine, folic acid and vitamin B₁₂ were estimated microbiologically in faeces from 4 normal subjects and 12 patients with various diseases. In the normal subjects the amounts of all vitamins per g. dry weight were similar, but wide variations were found in patients with enteritis, coeliac disease, pellagra and pernicious anaemia, and the values were much lower than in normal faeces. Cultures of faeces in media lacking nicotinic acid, folic acid or vitamin B₁₂ were analysed for their content of B vitamins, and the types of bacteria present were recorded. In faeces from patients with diseases of the gastrointestinal tract there appeared to be competition between bacteria which synthesised and bacteria which consumed the B vitamins. Removal of bacteria which consumed the vitamins permitted normal synthesis. In 2 subjects given terramycin a great decrease in excretion of all B vitamins occurred. The literature on the synthesis and destruction of B vitamins by many bacteria is reviewed and the findings are summarised in a table. The importance of the symbiotic relationships of intestinal bacteria is discussed with reference to the origin of vitamin deficiencies associated with certain diseases.—A. M. Copping.

5189

IMANAGA, H., HOSHIKAWA, S. and ITOI, J. Riboflavin content of human liver. *Nagoya J. Med. Sci.*, 1953, **16**, 212-217. [2. Dept. Surg., Sch. Med., Univ. Nagoya.]

Riboflavin was estimated fluorimetrically in samples of liver from 59 male and female subjects undergoing laparotomy. In those with clinically normal liver function the content of riboflavin was from 2445 to 3310, average 2806, μ g. per 100 g. fresh tissue. Values were slightly less in those with mildly impaired function. In subjects with greatly impaired liver function, in most of them through cancer of the stomach, pancreas or liver, the values were much lower, as low as 900 μ g. per 100 g. in a subject with carcinoma of the liver.

The proportion of free to esterified riboflavin was not much affected.—V. R. Jackson.

5190

ANNONI, G. and LONGARETTI, A. L'azione dell'acido pantotenico sul metabolismo basale. [Effect of pantothenic acid on basal metabolism.] L'azione dell'acido pantotenico sull sistema neurovegetativo studiata con la prova di Breitman. [Effect of pantothenic acid on the neurovegetative system, studied by Breitman's test.] *Acta vitaminol.*, 1954, **8**, 81-82; 83-84. [Osp. Civile G. Fornaroli, Magneta.] French, English, German and Spanish summaries.

Basal metabolism was estimated in 12 patients with moderate hyperthyroidism before and 1 hr. and 1, 3 and 5 days after intravenous administration of 1 g. pantothenic acid alcohol (pantenolo-Bepanten) daily. All the patients except 3 showed within the first hour some reduction of the B.M.R. which remained low to the end of the observation period. Of the 3 exceptions, 2 showed a fall after a day. Only one showed a rise. There was a certain improvement also in the patient's condition.

Breitman's test is based on measuring the areas of the reaction to histamine and adrenaline injected separately into the skin. The test was made on 11 subjects treated with pantothenic acid just as in the foregoing experiment. The areas of both sites of injection tended to be reduced by treatment with pantothenic acid, and the result is interpreted as evidence of a regulating action by pantothenic acid on the sympathetic and parasympathetic nervous systems.—E. M. Hume.

5191

CASASSA, P. M. Il pantenolo nel trattamento della stipsi cronica nei vecchi. [Pantothenic acid alcohol in the treatment of chronic constipation in the aged.] *Acta gerontol.*, 1953, **3**, No. 5-6, 15-22. [Ist. Clin. Med., Univ. Turin.] French and English summaries.

Fourteen patients aged from 68 to 91 years with obstinate constipation were treated with pantothenic acid alcohol (pantenolo-Bepanten, Roche), from 200 to 500 mg. daily given parenterally and sometimes orally later. In most of the patients, after injection of Bepanten, passage of gas and peristalsis quickly ensued, followed by satisfactory evacuation of the bowels. The effect did not usually decrease if treatment was maintained, and continued for a time after treatment was stopped. From 2 to 6 daily injections of 500 mg. followed by a daily oral dose of from 200 to 400 mg. is the dosage recommended.—E. M. Hume.

5192

BESSEY, O. A., ADAM, D. J. D., BUSSEY, D. R. and HANSEN, A. E. Vitamin B₆ requirements

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in infants. *Federation Proc.*, 1954, **13**, 451. [Dept. Biochem., Univ. Texas Med. Branch, Galveston.]

5193

HANSEN, A. E., WIESE, H. F., ADAM, D. J. D., BUSSEY, D. R. and WORSHAM, A. G. **Influence of pyridoxine on mineral balance in infant maintained on a convulsigenic milk preparation.** *Federation Proc.*, 1954, **13**, 460. [Dept. Paediat., Univ. Texas Med. Branch, Galveston.]

5194

TOENNIES, G., GALLANT, D. L., FRANK, H. G. and USDIN, E. **Nature of the blood folic acid system.** *Federation Proc.*, 1954, **13**, 311. [Inst. Cancer Res., Philadelphia, Pa.]

5195

BLEILLER, R. and PARSONS, H. T. **Folic acid and citrovorum factor excretion on a supplemented weighed diet.** *Federation Proc.*, 1954, **13**, 525. [Dept. Food Nutrit., Sch. Home Econ., Univ. Wisconsin, Madison.]

5196

LIEN-KENG, K. **Experiences with modern treatment of leukaemia in childhood.** *Ann. paediat.*, 1954, **182**, 202-217. [Paediat. Clin., Univ. Amsterdam.] German and French summaries.

5197

SUÁREZ, R. M., SUÁREZ, R. M. (Jr.), BUSÓ, R. and SABATER, J. **The effect of orally administered folinic acid in the treatment of tropical sprue.** *Blood, J. Hematol.*, 1954, **9**, 489-495. [Mimiya Hosp., Santurce, Puerto Rico.] Interlingua summary.

After an initial observation period with no treatment 5 patients with acute sprue were treated with folinic acid as calcium leucovorin by mouth. Four responded both clinically and haematologically to 15 mg. three times daily; the nature of the response was unaffected by the presence or absence of free HCl in the gastric juice. Two showed a secondary reticulocyte rise when the folinic acid was replaced by the same dose of folic acid. The fifth case responded poorly to all treatment.

L. Wills.

5198

ARUFFO, B. **Relations fonctionnelles entre la vitamine B₁₂ et l'acide folique en rapport avec la pathogénèse des anémies perniciosuses.** [Functional relation between vitamin B₁₂ and folic acid in relation to the pathogenesis of pernicious anaemias.] *Schweiz. med. Wochenschr.*, 1953, **83**, 1089-1092. [Milan.]

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A short review article deals with the relation of the two vitamins to one another, and with their action on oxidase systems and in the synthesis of nucleosides and nucleic acid. The different types of megaloblastic anaemia are considered to be caused by deficiency of one or both of the vitamins. The nature of the deficiency in the different types of anaemia is discussed.—L. Wills.

5199

HAENEL, U. **Die Wirkungsweise der oralen Perniciosatherapie mit Vitamin B₁₂ und Folsäure.** [Mode of action in oral treatment of pernicious anaemia with vitamin B₁₂ and folic acid.] *Schweiz. med. Wochenschr.*, 1953, **83**, 1029-1031 (with discussion 1031). [Med. Abt., Städt. Krankenanst., Mannheim.]

The finding is confirmed that folic acid and vitamin B₁₂, given together by mouth in doses shown previously to be completely inactive when given separately by mouth, will produce a haematological response. It was argued that the action could not be a simple summation effect but was more probably due to interrelated action in the synthesis of nucleic acids. In support of the view an untreated patient with pernicious anaemia was given daily for 5 days 60 mg. each of pure adenine, guanine and hypoxanthine, isolated from ribose-nucleic acid. As no reticulocyte rise occurred 15 µg. vitamin B₁₂, given orally, was added to the daily dose. After 7 days' combined treatment there was a reticulocyte crisis followed by a rise in the red cell count and Hb value. To exclude any intrinsic-factor-like action of folic acid another untreated patient received daily 0.5 mg. folic acid parenterally for 6 days; there was no reticulocyte response. The same dose was continued and at the same time 15 µg. vitamin B₁₂ were given by mouth daily; there was a reticulocyte crisis on the 7th day of combined treatment, followed by a rise in the red cell count and Hb value.—L. Wills.

5200

CLARKE, J. P. and ESSIG, L. L. **Megaloblastic anemia of pregnancy.** *Amer. J. Obstet. Gynecol.*, 1954, **67**, 367-372. [Dept. Med., Univ. Colorado Sch. Med., Denver.]

Three cases are reported.

5201

CARTAGENOVA, L. **Contributo alla conoscenza delle cosiddette anemie perniciosiformi (a megalociti) del lattante.** [The so-called pernicious-like (macrocytic) anaemias in infants.] *Lattante*, 1953, **24**, 856-859. [Ist. Giannina Gaslini, Genoa.] English summary.

The occurrence is recorded of 2 cases of the pernicious-like anaemia of infants, a girl of 12

months and a boy of 13 months. They were from families in very poor and unhygienic urban circumstances, and the etiology was deemed to be nutritional. After 2 months' treatment with liver extract and vitamin B₁₂, their condition was satisfactory.—E. M. Hume.

5202

FUKUSHIMA, K., SENDA, N., INUI, H., ISHIGAMI, S., WAKAMIYA, Y. and MURAKAMI, Y. **Hyperchromic anemia (non megaloblastic) relieved by vitamin B₁₂.** *Med. J. Osaka Univ.*, 1954, 4, 497-505. [2. Dept. Int. Med., Med. Sch., Univ. Osaka.]

Two patients, both with free HCl in the gastric juice and one with mild neurological symptoms, responded with a large reticulocyte rise to parenteral administration of vitamin B₁₂. Both patients developed hypochromic anaemia in the course of vitamin B₁₂ therapy; the Fe deficiency responded later to treatment with Fe.—L. Wills.

5203

OKUDA, K., WOOD, R. D., LANG, C. A. and CHOW, B. F. **Serum levels of vitamin B₁₂ in man.** *Federation Proc.*, 1954, 13, 471. [Dept. Biochem., Sch. Hyg. Pub. Health, Johns Hopkins Univ., Baltimore, Md.]

5204

HEINRICH, H. C. Die biochemischen Grundlagen der Diagnostik und Therapie der Vitamin B₁₂-Mangelzustände (B₁₂-Hypo- und Avitaminosen) des Menschen und der Haustiere. 2. Untersuchungen zum Vitamin B₁₂-Stoffwechsel des Menschen während der Gravidität und Lactation. [Biochemical basis for the diagnosis and treatment of vitamin B₁₂ deficiency states, partial and complete, in human beings and domestic animals. 2. Vitamin B₁₂ metabolism of human subjects during pregnancy and lactation.] *Klin. Wochenschr.*, 1954, 32, 205-209. [Physiol. Chem. Inst., Univ. Hamburg.]

Results from the literature and from the present series showed that during pregnancy and lactation the mean value for total vitamin B₁₂ in the serum was 183, with range from 3.6 to 310, $\mu\text{g.}$ per ml. compared with a mean value for healthy non-pregnant subjects of 238 with range from 62 to 460. In the series studied [no number given] 20 per cent. showed a biochemical deficiency of vitamin B₁₂, their mean value being 35 with range from 3.6 to 50, which are values near those of patients with pernicious anaemia. The pregnant subjects were all apparently normal. Tests on the colostrum and breast milk showed that, as in cows and ewes, of which the colostrum and milk contain far more vitamin B₁₂ than human colostrum and milk, the colostrum contained much

more of the vitamin than did the milk. There was more of the vitamin in the milk of mothers of full-term infants than in that of mothers of premature infants.

After intramuscular injection of 30 $\mu\text{g.}$ vitamin B₁₂ there was retention of the vitamin and an increased excretion in both urine and milk. In pregnant and lactating women with low serum values for total vitamin B₁₂, a single oral dose of 30 $\mu\text{g.}$ of the vitamin led to increased urinary excretion and a steady rise in the serum values, showing that absorption of the vitamin was adequate; addition of intrinsic factor led to greater urinary loss and a more rapid rise to normal of the serum values; excretion in the milk increased also. The vitamin B₁₂ requirement of pregnant and lactating women was calculated to be from 5 to 10 $\mu\text{g.}$ daily, which are amounts above the usual dietary intake. For treatment of patients with low serum values an oral preparation containing both vitamin B₁₂ and intrinsic factor is advised.—L. Wills.

5205

PITNEY, W. R. and BEARD, M. F. **Serum and urine concentrations of vitamin B₁₂ following oral administration of the vitamin.** *J. Clin. Nutrit.*, 1954, 2, 89-96. [Div. Haematol., Sch. Med., Univ. Louisville, Ky.] Spanish summary.

Vitamin B₁₂ was estimated with *Euglena gracilis* in blood serum and urine of normal subjects, and of patients with pernicious anaemia in relapse, before and after a large oral dose of vitamin B₁₂. With a dose of 1000 $\mu\text{g.}$ no significant rise in vitamin B₁₂ was detected in the serum, but an increase occurred after a dose of 5000 $\mu\text{g.}$ in both normal and anaemic subjects. In the serum, the vitamin was in bound form, which probably accounted for the very small increase in the urine after a large oral dose. In patients with pernicious anaemia the extent of the haematological response and the amount of vitamin B₁₂ in the serum were related.—A. M. Copping.

5206

KILLANDER, A. and VAHLQUIST, B. B₁₂-Vitamin-koncentrationen i serum från fullgångna och prematurt födda barn. [Concentration of vitamin B₁₂ in the serum of full-term and premature infants.] *Nord. Med.*, 1954, 51, 777-779. [Barnklin., Akad. Sjukhuset, Uppsala.] English summary.

Vitamin B₁₂ was estimated with *Euglena gracilis* in the blood of 12 full-term infants 1 to 10 days old, mean birthweight 3540 g., receiving only breast milk, of 12 premature infants, 6 to 83 days old, mean birthweight 1700 g., fed on breast milk with supplements of citrated milk, Fe and vitamins

A and D, and of 11 infants [not further described] where samples were taken of cord blood and maternal venous blood at birth.

If from 0.10 to 0.72 μg . per ml. serum is taken as the range of normal adult values, all but 2 of the first 24 sera gave values within normal limits; the 2 exceptions were well above, for no known reason. In the 11 with maternal values also, the cord blood in every case contained more vitamin B₁₂ than the maternal. No relation was found between vitamin B₁₂ values in serum and Hb, and none to the type of feeding or supplements given.

I. Leitch.

5207

ESTRADA, S. C., LANG, C. A. and CHOW, B. F. **The application of vitamin B₁₂ tolerance tests to American and Mexican subjects.** *J. Lab. Clin. Med.*, 1954, **43**, 406-410. [E. R. Squibb and Sons, Mexico, D.F.]

The urinary excretion of vitamin B₁₂ was measured with *Lactobacillus leichmannii* during 8 hr. after parenteral administration of a single dose of 20, 30, 40, 50 or 65 μg . vitamin B₁₂ to 51 Mexican subjects aged from 18 to 39 in Mexico City and to 47 American subjects aged from 24 to 47 in Baltimore. With all the amounts the Mexicans excreted significantly less than the Americans. The findings are attributed to differences in the dietary intake of vitamin B₁₂. The amounts in the Mexican diet were less than 0.2 μg . a week and those in the American diet about 1 to 5 μg . a day.—A. M. Copping.

5208

LANG, C. A., OKUDA, K., WOOD, R. D. and CHOW, B. F. **An oral tolerance test for vitamin B₁₂.** *Federation Proc.*, 1954, **13**, 464. [Dept. Biochem., Sch. Hyg. Pub. Health, Johns Hopkins Univ., Baltimore, Md.]

5209

WATKIN, D. M., BARROWS, C. H. (Jr.), CHOW, B. F. and SHOCK, N. W. **Renal clearance of intravenously administered vitamin B₁₂.** *Federation Proc.*, 1954, **13**, 161. [Sect. Gerontol., Nat. Heart Inst., Nat. Inst. Health, Bethesda, Md.]

5210

GLASS, G. B. J., BOYD, L. J. and STEPHANSON, L. **Inverse relationship between intake and utilization of vitamin B₁₂ in the intestine.** *Federation Proc.*, 1954, **13**, 54. [Dept. Med., New York Med. Coll., Flower and Fifth Ave. Hosps., New York.]

5211

SCRIMSHAW, N. S. and GUZMÁN, M. **Efecto de los suplementos dietéticos y de la administración**

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de vitamina B₁₂ y aureomicina sobre el crecimiento de los niños de edad escolar. [Effect of dietary supplements and administration of vitamin B₁₂ and aureomycin on the growth of schoolchildren.] *Bol. Ofic. sanit. panamer.*, 1953, **34**, 551-562.

5212

CHOW, B. F. **Vitamin B₁₂ and aging.** *Federation Proc.*, 1954, **13**, 453-454. [Dept. Biochem., Sch. Hyg. Pub. Health, Johns Hopkins Univ., Baltimore, Md.]

5213

WILTON, Å. **Genesen till pernicios anemi. [Pathogenesis of pernicious anaemia.]** *Nord. Med.*, 1954, **51**, 773-777. [Karolinska Sjukhus., Stockholm.]

5214

GRAHAM, R. M. and RHEAULT, M. H. **Characteristic cellular changes in epithelial cells in pernicious anemia.** *J. Lab. Clin. Med.*, 1954, **43**, 235-245. [Vincent Mem. Hosp., Boston, Mass.]

Detached squamous and columnar epithelial cells, most of which had been swallowed, were obtained by gastric suction from 20 patients with relapsed pernicious anaemia, 21 patients with pernicious anaemia in remission, 7 patients with iron deficiency or haemorrhagic anaemia, some of whom had free HCl in the gastric contents, and 10 normal subjects. In the patients with relapsed pernicious anaemia both squamous and columnar epithelial cells showed an increase in the size of cell and nucleus compared with those of any of the other subjects. Price-Jones curves confirmed the increase. It is suggested that the cellular changes resulted from a failure of maturation caused by deficiency of the extrinsic factor.

L. Wills.

5215

MONTO, R. W. and REBUCK, J. W. **Nasal instillation and inhalation of crystalline vitamin B₁₂ in pernicious anemia.** *Arch. Int. Med.*, 1954, **93**, 219-230. [Div. Haematol., Henry Ford Hosp., Detroit, Mich.]

In 12 patients with pernicious anaemia in relapse a single nasal instillation or inhalation of 100 μg . crystalline vitamin B₁₂ caused a maximum response, but one of 15 μg . by the same route had only submaximum results; a daily dose of 15 μg . produced a maximum response. In 20 patients in remission the maintenance dose was as low as 15 μg . every other week. No toxic effect or local reaction was seen. Vitamin B₁₂ appeared in the urine after nasal administration.—L. Wills.

5216

CHALMERS, J. N. M. and HALL, Z. M. **Treatment of pernicious anaemia with oral vitamin B₁₂ without known source of intrinsic factor.** *Brit. Med. J.*, 1954, i, 1179-1181. [Dept. Haematol., St. George's Hosp., London.]

When a single oral dose of from 2000 to 9000 μ g. vitamin B₁₂ was given, a satisfactory initial haematological and clinical response was obtained in 4 patients with pernicious anaemia in relapse, and in 2 with megaloblastic anaemia after gastrectomy; one similar patient given 1000 μ g. showed a suboptimum response. The patients were fasting and no food or drink was taken for 4 hr. after the vitamin was given. In 7 further patients with pernicious anaemia, a satisfactory response was obtained by the use of a daily oral dose of 50 μ g. vitamin B₁₂ taken at midnight; no food was allowed for 6 hr. before and after. One patient was brought into and maintained in remission for 18 months on a daily oral dose of 50 μ g. taken on retiring. When taken with food the vitamin was much less effective than when taken fasting. Tween 20 had no apparent effect on absorption.

L. Wills.

5217

ROSS, G. I. M., MOLLIN, D. L., COX, E. V. and UNGLEY, C. C. **Hematologic responses and concentration of vitamin B₁₂ in serum and urine following oral administration of vitamin B₁₂ without intrinsic factor.** *Blood, J. Hematol.*, 1954, 9, 473-488. [Postgrad. Med. Sch., London.] Interlingua summary.

Vitamin B₁₂ was estimated biologically with *Euglena gracilis* var. *bacillaris* in the serum and urine before and after test doses of 500, 1000 or 3000 μ g. of the vitamin by mouth. There were 38 patients with pernicious anaemia in relapse, 2 with megaloblastic anaemia after partial gastrectomy and 4 normal subjects.

The sensitivity and specificity of the method are not such as to make it possible to distinguish patients with pernicious anaemia in relapse from normal subjects. Evidence of absorption of vitamin B₁₂ from the rectum suggested that absorption does not require the presence of intrinsic factor. Details of serum and urine concentration and of haematological response are presented in tables and graphs.—L. Wills.

5218

MEULENGRACHT, E. **Treatment of pernicious anaemia with very small quantities of pyloric mucosa and vitamin B₁₂.** *Brit. Med. J.*, 1954, i, 838-841. [Med. Dept. B, Bispebjerg Hosp., Copenhagen.]

The site of production of intrinsic factor having been shown to be the pyloric mucosa (Absts. 896,

3501, Vol. 23), a preparation of dried pig pyloric mucosa was tested on patients with untreated pernicious anaemia. Minute amounts, 0.3 to 0.6 g. daily by mouth, produced only a slight and inadequate reaction in 9 of 12 patients, but the same amounts with 5 or 10 μ g. pure vitamin B₁₂ gave a full reticulocyte crisis and rise of both Hb and red cells. A proprietary preparation [called Cycoplex 7 times and Cycoplex 4 times] with 0.05 g. dried pyloric mucosa and 5 μ g. vitamin B₁₂ per capsule, 3 daily, was similarly effective in hospital practice. It remained to be shown whether there was any difference in effect when the treatment was given with meals or between meals.—I. Leitch.

5219

SWENDSEID, M. E., GASSTER, M. and HALSTED, J. A. **Absorption of vitamin B₁₂ in individuals with a functioning gastric mucosa.** *Federation Proc.*, 1954, 13, 308. [Dept. Home Econ., Univ. California, Los Angeles.]

5220

CALLENDER, S., TURNBULL, A. and WAKISAKA, G. **Intrinsic factor after total gastrectomy.** *Clin. Sci.*, 1954, 13, 221-224. [Nuffield Dept. Clin. Med., Radcliffe Infirmary, Oxford.]

In 8 patients who had undergone total gastrectomy the secretion of intrinsic factor was estimated indirectly from the amount of radio-activity appearing in the faeces after a test dose of vitamin B₁₂ labelled with ⁶⁰Co. In 7 patients the excretion was over 80 per cent. and in 1 patient it was 67 and 66 per cent. in 2 tests. The values are of the same order as those found in patients with pernicious anaemia. When radio-active vitamin B₁₂ was given with 10 mg. of a dried concentrated extract of pig gastric mucosa as source of intrinsic factor, the excretion fell to 57 per cent. or less in the 7 patients and to 29 per cent. in the one. The findings are considered to support the view that in man intrinsic factor is produced only in the stomach. The smaller excretion in the one patient was thought probably due to incomplete removal of stomach tissue.—L. Wills.

5221

YAMAMOTO, R. S. and CHOW, B. F. **A rapid method for the determination of B₁₂ binding power in the gastric juice.** *J. Lab. Clin. Med.*, 1954, 43, 316-320. [Dept. Biochem., Sch. Hyg., Johns Hopkins Univ., Baltimore, Md.]

Vitamin B₁₂ was found to combine with a substance or substances in gastric juice in such a way that it could not be adsorbed by resting cells of *Lactobacillus leichmannii*. The observation was utilised to measure the vitamin-B₁₂-binding capacity of gastric juice. From adult patients with

pernicious anaemia, the gastric juice had a lower binding capacity than from adolescent patients or from normal adults. There appeared to be an association between high gastric acidity and low capacity for binding vitamin B₁₂ in normal subjects over 60 years of age, but not in subjects aged from 25 to 45. The gastric juice of old people with achlorhydria had normal ability to bind vitamin B₁₂.—A. M. Copping.

5222

PITNEY, W. R., BEARD, M. F. and VAN LOON, E. J. **Observations on the bound form of vitamin B₁₂ in human serum.** *J. Biol. Chem.*, 1954, **207**, 143–152. [Sect. Haematol., Dept. Med., Sch. Med., Univ. Louisville, Ky.]

The concentration of vitamin B₁₂ estimated with *Euglena gracilis* varied from 122 to 460, mean 195, $\mu\text{g.}$ per ml. in 13 normal sera, in 10 of which all the vitamin was present in a bound form. When 1000 $\mu\text{g.}$ crystalline vitamin B₁₂ per ml. were added to serum *in vitro* relatively small amounts became bound, the mean concentration of the bound form being increased from 178 to 336 $\mu\text{g.}$ per ml. Paper strip electrophoresis was used to identify the serum protein fractions containing bound vitamin B₁₂. Almost all the activity was found in the α -globulin fractions, very little in the other globulins, and none in the albumin. In addition, the vitamin B₁₂ bound *in vitro* was mainly recovered from the α -globulin fractions.

Investigation of 20 sera from patients with different diseases other than anaemia gave a range of total vitamin B₁₂ from 50 to 540, mean 193, $\mu\text{g.}$ per ml.; the values thus corresponded closely with those for normal sera. The nature of the substance binding vitamin B₁₂ and the importance of this function of certain fractions of the serum proteins are discussed.—A. M. Copping.

5223

DAVIS, R. L. and CHOW, B. F. **Vitamin B₁₂ binding substances in human serum.** *Federation Proc.*, 1954, **13**, 33. [Lab. Serv., VA Hosp., Baltimore, Md.]

5224

MILLER, O. N., UNGLAUB, W. G. and GOLDSMITH, G. A. **Interaction among vitamin B₁₂, materials with intrinsic factor activity and serum proteins.** *Federation Proc.*, 1954, **13**, 265. [Dept. Med., Tulane Univ. Sch. Med., New Orleans, La.]

5225

GLASS, G. B. J., BOYD, L. J., GELLIN, G. A. and STEPHANSON, L. **Test for intrinsic factor activity: measurement of hepatic uptake of ingested radioactive vitamin B₁₂.** *Federation*

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Proc., 1954, **13**, 54–55. [Dept. Med., New York Med. Coll., Flower and Fifth Ave. Hosps., New York.]

5226

DUBARRY, J. J. and CASTETS, H. P. **Le devenir d'une sprue nostras gravissime au bout de trois ans et demi de traitement par la vitamine B₁₂. [Outcome of three and a half years of treatment with vitamin B₁₂ in a very severe case of sprue.]** *Arch. Mal. Appar. digest.*, 1953, **42**, 1379–1382 (with discussion 1382–1383).

The patient was brought into and maintained in a fairly satisfactory clinical condition by the continuous administration of vitamin B₁₂; the stools were nearly normal and there was a considerable gain in weight. At no time was the anaemia or the abnormal blood lipid picture completely corrected, and the renal condition did not improve.—L. Wills.

5227

FLASCHENTRÄGER, B., HALAWANI, A. and NABEH, I. **Alkaptonurie und Vitamin B₁₂. [Alkaptonuria and vitamin B₁₂.]** *Klin. Wochenschr.*, 1954, **32**, 131–133. [Dept. Biochem., Fac. Med., Univ. Alexandria.]

The urinary output of homogentisic acid in a patient with alkaptonuria was unaffected by the intramuscular injection of 2 $\mu\text{g.}$ vitamin B₁₂.

L. Wills.

Vitamin C

5228

ADAMS, J. F. **Scurvy occurring in a patient on an ulcer diet: report of a case.** *Glasgow Med. J.*, 1954, **35**, 64–65. [Univ. Dept. Med., Royal Infirmary, Glasgow.]

5229

LUTZ, R. N., STEELE, B. F., PIERCE, Z. H. and WILLIAMS, H. H. **Ascorbic acid in the white cells and sera of human subjects fed low intakes of the vitamin after saturation or partial depletion.** *Federation Proc.*, 1954, **13**, 466. [Dept. Biochem., Cornell Univ., Ithaca, N.Y.]

5230

LINKSWILER, H. **Ascorbic acid in blood following ingestion of dehydro and reduced ascorbic acid.** *Federation Proc.*, 1954, **13**, 464. [Res. Lab. Human Nutrit., Univ. Alabama, University.]

5231

FREEMAN, J. T. and HAFKESBRING, R. **Ascorbic acid levels in blood and gastric secretions. 3. Gastrointestinal diseases.** *Federation Proc.*, 1954, **13**, 48. [Woman's Med. Coll. Pennsylvania, Philadelphia.]

5232

FEUILLEN, Y. M. Iron metabolism in infants. 2. Absorption of dietary iron.

FEUILLEN, Y. M. and LAMBRECHTS, A. 3. The influence of vitamin C on the absorption of iron. *Acta paediat.*, 1954, **43**, 181-187; 188-191. [Clin. Policlin. Maladies de l'Enfance, Univ. Liège.] French, German and Spanish summaries.

For part 1, see Abst. 674, Vol. 23.

2. Thirty-seven Fe balance experiments were made on 19 full-term infants at ages ranging from 15 days to 9 months. The artificial diets were a mixture of milk, water, sucrose, dextrimaltose or starch, with or without vegetable soup; buttermilk and acid milk; commercial acid milk; or commercial buttermilk. The Fe intake ranged from 0.3 to 1.08 (mean 0.37) mg. per kg. bodyweight daily. The average retention was 0.19 (range 0.0 to 0.56) mg. per kg. bodyweight daily, or 53 per cent. of the mean intake. There were two zero balances and none negative. In 2 experiments with infants fed on breast milk the intakes were 0.08 and 0.12 mg. and the retentions 0.04 and 0.09 mg. or 48 and 78 per cent.

3. Fourteen Fe balance studies with 7 infants aged from 4 to 7½ months on a normal diet showed that the addition of 100 mg. vitamin C daily had no effect on the absorption or retention of Fe.

W. Godden.

Vitamin D

5233

MIKI, T., MACHII, S., UNO, C., FUKUDA, M., HASHIMOTO, M., OURA, T., IWASAKI, H., MATSUMOTO, K., GOSHI, N., OSE, T. and SHIMOYAMA, M. [On infantile rickets in cities and villages around Osaka.] 1. *J. Osaka City Med. Center.*, 1953, **2**, 309-315 (English summary, p. 347). [Med. Affairs Sect., Osaka Prefecture, Osaka City.]

Of 843 infants aged between 2 and 6 months, born in winter, and living in the environs of Osaka City, 10.2 per cent. were found rachitic from X-ray pictures of the hand. The incidence is analysed according to district, sex, system of feeding and age. Administration of from 200 to 500 I.U. vitamin D daily in fortified powdered milk did not prevent the occurrence of the disease. Respiratory infections were more common among rachitic than non-rachitic infants. (From summary.)

D. Harvey.

5234

HELLBRÜGGE, T. Vergleichende statistische Erhebungen über den Erfolg verschiedener Methoden der Rachitisprophylaxe. [Comparative statistical results on the effect of

different methods of rickets prophylaxis.] *Monatsschr. Kinderheilk.*, 1954, **102**, 170. [Munich.]

5235

GLEISS, J. Zur Vitamin D-Dosierung bei Frühgeborenen. [Vitamin D dosage for premature infants.] *Monatsschr. Kinderheilk.*, 1954, **102**, 177-179. [Düsseldorf.]

See Abst. 3715, Vol. 24.

5236

ZWEYMÜLLER, E. and RÖSSLER, H. Chronische vitamin-D-resistente Rachitis mit Nephrocalcinose. [Chronic rickets resistant to vitamin D with calcification of the kidney.] *Helv. paediat. Acta*, 1954, **9**, 28-42. [Kinderklin., Univ. Innsbruck.] French, Italian and English summaries.

Rickets had persisted in a girl of 16½ years since infancy in spite of treatment with cod liver oil and vitamin D₂. There was a calcified lesion of the kidneys, visible radiographically, which gave rise to acidosis and high blood chloride. Treatment with an alkaline mixture and dihydrotachysterol restored the X-ray picture of the skeleton to normal apart from deformities.—E. M. Hume.

5237

RUPP, W. and SWOBODA, W. Clearance-Untersuchungen bei Vitamin D-resistenter Rachitis. [Clearance tests in vitamin-D-resistant rickets.] *Monatsschr. Kinderheilk.*, 1954, **102**, 173-175. [Vienna.]

Inorganic P was estimated in the blood serum and urine of 2 normal subjects and 3 patients with resistant rickets before and after intravenous injection of phosphate with or without an aqueous solution of vitamin D₂. In the patients, the amounts of PO₄ excreted in the urine on the normal diet was within the higher range of normal, but after injection of phosphate the serum value rose and the amount excreted was much greater than in the normal subjects. Glomerular filtration was normal but tubular re-absorption was defective. When vitamin D₂ was given as well to the patients the serum value rose higher than without it, and tubular re-absorption increased by 50 per cent.

Use of a vitamin D preparation which could be given intravenously made possible the conclusion that vitamin D improved the defective tubular re-absorption and delayed the loss of P from the blood.—E. M. Hume.

5238

SALASSA, R. M., POWER, M. H., ULRICH, J. A. and HAYLES, A. B. Observations on the metabolic effects of vitamin D in Fanconi's syndrome.

N.A. and R., October 1954

Proc. Staff Meetings Mayo Clin., 1954, **29**, 214-224.

A daily dose of 400,000 "units" of vitamin D was given for 30 days to 2 patients, aged 16 and 11 years, with Fanconi's syndrome. Carefully controlled metabolism experiments showed that the dose had no immediate effect on the abnormal metabolism, but that it gradually increased the plasma values for bicarbonate and P until they became normal, and reduced the urinary excretion of amino-N and ammonia. Figures are given for the change in excretion of individual amino-acids. There was a significant decrease in the urinary output of sugar in one patient and probably in the other also. The faecal output of P decreased greatly, and the urinary output increased only slightly, so that the P balance improved. Renal clearance of P decreased by 37 and 44 per cent. in the patients. The retention of Ca was increased, though the renal clearance of Ca also increased. Endogenous creatinine clearance was normal before and after treatment. There was associated clinical improvement.—L. Wills.

5239

VAN CREVELD, S. and ARONS, P. **Further experiences in a special case of renal osteoporosis with aminoaciduria, treated with dihydrotachysterol.** *Ann. paediat.*, 1954, **182**, 191-202. [Child. Clin., Univ. Amsterdam.] German and French summaries.

For earlier work see Abst. 5450, Vol. 19.

Further attacks of severe osteoporosis in the patient are reported; they failed to respond to vitamin D and were associated with loss of amino-acids, including cystine, in the urine, but responded to large doses of dihydrotachysterol. The boy, now 6 years old, is kept in good condition on a maintenance dose of dihydrotachysterol; treatment is controlled by estimation of serum Ca.

L. Wills.

5240

BADENOCH, J. and FOURMAN, P. **Osteomalacia in steatorrhoea.** *Quart. J. Med.*, 1954, **23**, 165-176. [Nuffield Dept. Clin. Med., Radcliffe Infirmary, Oxford.]

The absorption of calcium and vitamin D was studied in 6 patients with steatorrhoea. Estimation of Ca balance in 2 of them showed that on a high-fat diet without vitamin D the faecal Ca output exceeded the intake, and the balance was still negative after 10,000 I.U. vitamin D daily had been given orally or parenterally. When, however, the Ca intake was increased, and the vitamin was given by intramuscular injection, the balance became positive. Estimation of fat in the faeces showed that when the Ca intake was less than the amount that could combine with the fat present the Ca balance was negative, but it

became positive when the Ca intake exceeded the fat equivalent. When the fat intake was low, daily oral doses of 30,000 I.U. vitamin D and a high Ca intake produced a positive Ca balance. In 3 of the patients, osteomalacia developed while they were receiving 1500 I.U. vitamin D and 2 g. calcium lactate by mouth daily. All the patients recovered slowly when given vitamin D by injection and from 15 to 30 g. calcium lactate daily, but the rate of retention of Ca was very slow.

L. Wills.

5241

SCHEPPE, K. J. Studien zur Cöliakie-Rachitis. [Coeliac rickets.] *Monatsschr. Kinderheilk.*, 1954, **102**, 175-176. [Munich.]

A report of a case.

5242

GERTLER, W. Zur Frage der Spätschäden bei der langdauernden Vitamin D-Behandlung der Hauttuberkulose. [The problem of late injury in protracted treatment of skin tuberculosis with vitamin D.] *Ztschr. Tuberk.*, 1953, **103**, 26-50. [Hautklin., Univ. Leipzig.]

Mean values for blood pressure are given for 94 males and 186 females aged from 10 to 80 years, after treatment for skin tuberculosis with 1 mg. vitamin D₂ daily for 2½ and 3½ years in 1948-51. For comparison, mean values are given for patients of the same age without circulatory diseases, attending the Klinik in the same years and not given vitamin D.

After 2½ years treatment with vitamin D there was generally a tendency for the mean systolic blood pressure to be above normal, though the tendency differed at different ages and was more marked in men than women. After 3½ years the mean value was lower than after 2½ years and in women over 40 it was below normal.

Electrocardiograms for 127 patients and tests of kidney function for 172 showed some signs of abnormality not deemed severe. Values for residual N were liable to severe fluctuation, but very few were over 40 mg. per cent., considered the highest limit of normal.

It is concluded that a daily dose of 1 mg. vitamin D₂ can be continued indefinitely without risk of serious injury in patients without clinical contra-indications.

Vitamin D is considered to act by influencing central-nervous regulation of metabolism.

E. M. Hume.

See also Abst. 5270.

Other Vitamins

5243

DYGGVE, H. V., DAM, H. and SØNDERGAARD, E. **Comparison of the action of vitamin K₁ with that of synkavit in the newborn.** *Acta paediat.*,

1954, **43**, 27-31. [Dept. Obstet. A, Univ. Hosp., Copenhagen.] French, German and Spanish summaries.

In newborn infants with prothrombin times prolonged to varying extents, there was no significant difference in the rate of action of vitamin K₁ and Synkavit in reducing the prothrombin time when the vitamins were given intravenously in doses of 10 or 0.1 mg., or orally in doses of 10 mg. The results differ from those obtained with vitamin-K-deficient chicks, and with chicks or patients treated with dicoumarol, where it was found that vitamin K₁ acted more rapidly than Synkavit. Administration of *dl*- α -tocopherol given 24 hr. previously had no effect on the action of injected vitamin K₁.—L. Wills.

5244

VERSTEEG, P. and VERSTEEGH, E. T. B. Het gehalte aan proconvertine in het bloed van vroeggeborenen. [**Proconvertin content of the blood of premature infants.**] *Nederland. Tijdschr. Geneesk.*, 1954, **98**, 1296-1298. [Kinderclin., Univ. Amsterdam.] English summary.

Proconvertin, a recently discovered coagulation factor, was estimated in the blood of 39 premature infants of weight between 1500 and 2500 g. All of them had an intramuscular injection of 10 mg. vitamin K on the first day of life, and 10 mg. vitamin K by mouth, some for 2 subsequent days and some to the end of the experiment at 8 weeks of age. There was less proconvertin in the blood of premature than of full-term infants and the upper values were higher in those that continued to get vitamin K, than in those that did not, though the response was less than in full-term infants. One twin with melaena had the same proconvertin value as the normal twin.

I. Leitch.

5245

TOOHEY, M. **Vitamin K₁ in anticoagulant therapy.** *Brit. Med. J.*, 1954, **i**, 1020-1022. [New End Hosp., London, N.W.3.]

Vitamin K, from 5 to 50 mg., counteracted the effect of anticoagulant treatment in 68 of 70 patients, but there was a risk that large doses of vitamin K might make the patient refractory to further anticoagulant treatment.—L. Wills.

5246

MERKLEN, F. P. and RIOU, M. Résultats favorables d'un an d'essai de dérivés vitaminiques K dans la lépre. [**Favourable result of one year's experimental treatment with vitamin K derivatives in leprosy.**] *Bull. Soc. Pathol. exot.*, 1953, **46**, 741-748. [Pavilion de Malte, Hôp. Saint-Louis, Paris.]

Four patients with leprosy were treated with a daily injection of water-soluble vitamin K, usually

of 50 to 100 mg. The effect was considered to be very satisfactory, and among other advantages the tolerance to sulphone drugs was greatly increased. Use of the vitamin is recommended as auxiliary to other treatments.—E. M. Hume.

5247

FLOCH, H. and SUREAU, P. La vitaminothérapie K dans la lépre. [**Vitamin K treatment in leprosy.**] *Bull. Soc. Pathol. exot.*, 1953, **46**, 631-638. [Inst. Pasteur, French Guiana.]

Six patients having leprosy of various types were treated for short periods with injections of water-soluble vitamin K (K-Thrombyl, Laboratoires Roussel). Some seemed to derive definite benefit but others did not. The time of treatment is considered to have been very short.

E. M. Hume.

5248

CUTILLO, S. Osservazioni sull'impiego del "T vitamin G" in pediatria. [**Use of T-vitamin Goetsch in paediatrics.**] *Lattante*, 1953, **24**, 845-855. [Inst. Clin. Pediat., Univ. Naples.] English summary.

T-Vitamin Goetsch (Pharmazell) was given to 2 patients with coeliac disease, 12 premature infants, and 28 children with dystrophy. The children improved but were receiving at the same time the accepted treatments for their conditions.

E. M. Hume.

5249

STREHLER, E. and HUNZIKER, K. Behandlung von Magendarmgeschwüren mit Kohlsaft und Bananenfrappé (Anti-Ulcus-Faktor, Vitamin U). [**Treatment of peptic ulcer with cabbage juice and banana frappé (anti-ulcer factor, vitamin U).**] *Schweiz. med. Wochenschr.*, 1954, **84**, 198-200. [Med. Klin., Univ. Berne.]

DENTAL DISEASES

5250

BRITISH DENTAL ASSOCIATION CHILD DENTAL HEALTH COMMITTEE. **Dental health of children : memorandum.** *Brit. Dent. J.*, 1954, **96**, 199-220.

The Child Dental Health Committee's memorandum (pp. 199-202) covers the line of approach to the problem of dental ill-health and lists the measures likely to be of value for its solution. It recommends acceleration and widening of dental research, fluoridation of water supplies on an experimental scale, fuller use of the dental service for children and extension of education in dental health. Appendix A (pp. 202-219), in 7 parts by a group of authorities whose interest is largely academic, briefly reviews knowledge of the control of caries by local measures, applications of local

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measures through oral hygiene, fluoridation of domestic water supplies, causes of malocclusion, diet, breast feeding and dental sepsis. Appendix B (pp. 219-220) summarises the present position of dental health education in the United Kingdom. D. Harvey.

5251

BOYD, J. D. **Epidemiologic studies in dental caries. 6. A review of intrinsic factors as they may affect caries progression.** *J. Pediat.*, 1954, **44**, 578-590. [Radioisotope Unit, Veterans Admin. Hosp., New Orleans, La.]

5252

DUNNING, J. M. **The influence of latitude and distance from seacoast on dental disease.** *J. Dent. Res.*, 1953, **32**, 811-829. [Harvard Univ., Boston, Mass.]

This geographical study is based on the results of Britten and Perrott (*Pub. Health Rep.*, Washington, 1941, **56**, 41), Ferguson (*J. Amer. Dent. Assoc.*, 1935, **22**, 392) and Nizel and Bibby (Abst. 759, Vol. 15) for U.S. service recruits, Mills (Abst. 5594, Vol. 7) for U.S. rural schoolboys, Ockerse (Abst. 5461, Vol. 19) for white children in South Africa, Andrews (*Austral. J. Dent.*, 1948, **52**, 12) for men and women of the Royal Australian Air Force, and Saunders (Abst. 2215, Vol. 16) for children in New Zealand.

Analysed by States, the U.S. service data strongly suggested that the prevalence of dental disease (mainly caries) increased from south to north and decreased as the distance from the sea increased; the relationships could be shown to be statistically significant. Mills's data for children corroborated the latitude effect. A similar pattern, inverted, was found in South Africa when districts with over 0.7 p.p.m. F in the water were excluded. Australia showed the latitude effect only. New Zealand did not, possibly because of its small size or the preponderating effects of other local conditions.

Possible reasons for the relationships are discussed in detail. The latitude effect may be related to sunshine or temperature or both. Ockerse's data indicate a significant negative correlation between mean daily sunshine and prevalence of dental disease. As for temperature, it is suggested that in cooler regions there may be a tendency to meet the increased energy requirements with carbohydrate foods. Greater urbanisation in the northern States does not seem to be responsible. The sea-coast effect may be partly due to greater use there of surface water low in F, but there is evidence that total hardness of water, rainfall, and relative humidity may play a part, and further studies on these are required.

W. M. Deans.

5253

PARFITT, G. J. and PARFITT, J. B. **Caries incidence rate—from childhood to middle age.** *Brit. Dent. J.*, 1954, **96**, 183-187. [Dept. Prev. Dent., Inst. Dent. Surg., Gray's Inn Road, London, W.C.1.]

Records from a private dental practice were available for 104 subjects from age 3 years for both temporary and permanent dentitions and for 60 others from age 6 years for permanent dentitions.

From the first set of data the average number of cavities per year in each dentition was calculated; there was evidence that the rates for temporary and permanent teeth were similar. For the second group 16 curves showing the yearly caries experience of individuals are reproduced. Of the 60, 21 showed no change with age, 30 minor deviations and 9 an abrupt change. In only 9 was there a decrease with advancing age.

Possible causes of these differences are considered and in a short appendix the methods of expressing the incidence of dental caries are discussed.—D. Harvey.

5254

GÖBEL, F. and DUFFNER, K. **Vergleichend-Statistische Erhebungen über Zahnerkrankungen bei Mensch und Pferd. [Comparative statistical data on dental diseases in man and horse.]** *Berl. Münch. tierärztl. Wochenschr.*, 1954, **67**, 165-170. [Tierklin., Tierhyg. Inst., Freiburg i. Br.] English summary.

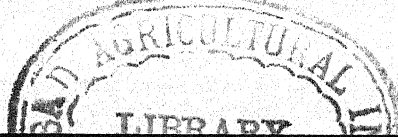
A comparative study over 3½ years of the dental disorders of 4751 human patients in the practice of one of the authors and of 119 horses treated at the *Tierklinik* because they were feeding badly and losing condition showed that, although many disorders are common to man and horse, their incidence differs widely. Caries was by far the commonest in man, but was found in only 3 of the horses. It is suggested, however, that caries is becoming commoner in horses owing to the use of prepared feeds or feeds richer in carbohydrate. On the other hand, 51 horses had lesions due to sharp-pointed teeth, and 29 had periodontitis.

W. M. Deans.

5255

BAŽANT, V., MIKSA, J. and ŠKOPKOVÁ, M. **Zubní kaz a výživa mládeže na Sedlčanskú, Rakovnicku a v Praze v letech 1948 a 1949. [Dental caries and nutrition of the young in the regions of Sedlčany, Rakovnik and Prague in the years 1948 and 1949.]** *Čas. Lék. čes.*, 1954, **93**, 140-144. [1. Stomatol. Clin.] English and Russian summaries.

Surveys were made in the 3 regions of the incidence of dental caries and of the food consumption



of schoolchildren. The items studied were the intakes of calories, fat, carbohydrate and animal and vegetable protein. The composition of the diet was best in the Rakovnik region, worst in Sedlčany and intermediate in Prague. Consumption of rye bread was largest in Rakovnik, and of sugar in Sedlčany. The state of the teeth reflected the composition of the diet, and was best in Rakovnik, worst in Sedlčany and intermediate in Prague. [From summary.]—E. M. Hume.

5256

JONES, R. V. H. and MYNOTT, M. J. **Changes in dental hypoplasia and caries among the children of Finnish Lapps, 1939-50.** *Brit. Med. J.*, 1954, i, 682-684. [St. Thomas's Hosp. Med. Sch., London.]

To find what changes had occurred as a result of disturbed living conditions in their country Finnish Lapp children were examined in 1950 and the data were compared with those obtained by Mellanby in 1939 (Abst. 2049, Vol. 10). Of 92 Inari Lapp children 6 were caries-free compared with 3 of 70 in 1939, and in those between 6 and 9 years of age the percentage of carious teeth was only 42.8 against 68.3 in 1939. The changes in the food supplies of the population during and subsequent to the war time occupation of the country are discussed, and it seems that the lower incidence of caries is due not to greater resistance of the teeth as measured by surface hypoplasia but to external influences, of which the diminished consumption of sugar is probably the most favourable.—D. Harvey.

5257

PALFER-SOLLIER, M. **Étude de la carie dentaire dans un groupe d'enfants d'âge scolaire de la région parisienne.** [Study of dental caries in a group of schoolchildren in Paris.] *Bull. Inst. nat. Hyg., Paris*, 1954, 9, 393-402. [Sect. Stomatol.]

5258

HURTARTE, A. **Hallazgos dentales en niños escolares del departamento de Sacatepéquez relacionados con estudios nutricionales.** [Dental findings in schoolchildren in the Department of Sacatepéquez, in relation to diet studies.] *Bol. Col. Estomatol., Guatemala*, 1953, 1, 2-8.

5259

Roos, A. **Zum Problem der Zahncaries. Stand der Zahncaries in der Schweiz.** [Problem of dental caries. Position of dental caries in Switzerland.]

KALLENBERGER, K. **Zusammenhang zwischen Fluor und Zahnsystem.** [Relation of fluorine to the dental system.]

BAY, R. **Möglichkeiten und Methoden der Cariesprophylaxe mit Fluor.** [Possibilities and methods of preventing caries with fluorine.]

WESPI, H. **Besteht ein Antagonismus zwischen Jod und Fluor?** [Is there an antagonism between iodine and fluorine?]

SCHMID, H. **Fluor und Cariesprophylaxe.** [Fluorine and prevention of caries.]

BAUME, L. **Cariesprophylaxe durch Fluor in Theorie und Wirklichkeit.** [Prevention of caries with fluorine in theory and practice.] *Schweiz. med. Wochenschr.*, 1954, 84, 327-328; 328; 328; 328; 328-329; 329. [Basle.]

5260

CORNER, L. B. **About fluorine.** *Brit. Dent. J.*, 1954, 96, 155-158.

A lecture report.

5261

SCHMIDT, H. J. **Frauenarzt und Kariesprophylaxe.** [The obstetrician and caries prevention.] *Münch. med. Wochenschr.*, 1954, 96, 297-298. [Lohengrinstr. 18/1, Degerloch, Stuttgart.]

Treatment of the mother and infant with fluoride for caries prevention is urged, the work of Held (Abst. 4894, Vol. 24) being specially quoted in support of the recommendation.—E. M. Hume.

5262

STONES, H. H. **Fluoridation of domestic water supplies in the control of dental caries.** *Brit. Dent. J.*, 1954, 96, 173-183. [Dept. Dent. Surg., Univ. Liverpool.]

A review.

5263

ONISI, M. and SAITO, H. **Caries susceptibility of the enamel and the cementum in human teeth, with emphasis on the fluorine problem.** *Yokohama Med. Bull.*, 1953, 4, 294-297. [Dept. Microbiol., Dent. Fac., Tokyo Med. Dent. Univ.]

Examinations were made of 3154 teeth extracted by 21 dentists in 17 communities and susceptibility to caries of enamel and cementum was assessed. The possibility is recognised that errors may lie in the assumption that the caries-producing agents attack enamel and cementum equally and independently. From the statistical analysis made it is concluded that the susceptibility of enamel to caries is more variable but less than that of cementum; its being less susceptible may be caused by an action of fluorine.—D. Harvey.

See also Absts. 4649, 5152.

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POISONS: PATHOGENIC ORGANISMS: FOOD LAWS

5264

HAKIM, S. A. E. **Argemone oil, sanguinarine, and epidemic dropsy glaucoma.** *Brit. J. Ophthalmol.*, 1954, **38**, 193-216. [Dept. Physiol., Univ. Oxford.]

5265

SHAH, V. B. **Epidemic dropsy.** *Antiseptic*, 1954, **51**, 197-200. [Vagra, Dist. Broach.]

5266

KAVOURA, C. **Bemerkungen zu einigen Fällen von Favismus. [Notes on some cases of favism.]** *Münch. med. Wochenschr.*, 1954, **96**, 249-250. [Odos Prinz Nikolaus 2, Salonika.]

In the children's clinic of the Central Hospital, Salonika, 10 cases of favism, all in boys, were seen in 1952-53, none having been seen previously since 1943. Other hospitals had the same experience. The season was a very wet one. The broad bean (*Vicia faba*) had usually been eaten raw. The

signs and symptoms are described; vomiting and destruction of red cells were prominent. One child of 10 months, still breast fed, became ill after the mother had eaten broad beans without any adverse effect on herself. Case histories are given. The most satisfactory treatment was by blood transfusion; one child for whom this was impossible died.—E. M. Hume.

See also Abst. 5048.

IMMUNITY

5267

VIGNEC, A. J. and WEINBERG, S. **Grape juice in infant feeding. Comparative sensitivity to orange and grape.** *J. Pediat.*, 1954, **44**, 294-298. [Dept. Paediat., New York Foundling Hosp.]

Diluted grape juice was an acceptable fluid to 97.6 per cent. of 365 infants. When 379 children were tested intradermally with diluted grape and orange juice there were 18 positive reactions to grape juice and 23 to orange juice.—F. C. Aitken.

THERAPEUTIC AND PREVENTIVE DIETETICS**GENERAL**

5268

HAHN, H. **Kritisches zur Ernährungstherapie. [Critical review of diet treatment.]** *Deutsch. med. Wochenschr.*, 1954, **79**, 941-944. [Inn. Abt., Städt. Krankenanst., Mannheim.]

5269

MARQUARDT, G. H., CUMMINS, G. M. (Jr.), RIGGS, L. A. and FISHER, C. I. **Clinical usefulness of new milk protein supplement.** *J. Amer. Med. Assoc.*, 1954, **154**, 1164-1167. [Dept. Med., Northwestern Univ. Med. Sch., Chicago, Ill.]

Skimmed milk is passed through ion exchange columns, pasteurised and evaporated and iso-electric casein is added. The high-protein, low-sodium preparation obtained, Krallex, has been used successfully as an oral protein supplement in disorders such as glomerulonephritis, portal cirrhosis, anorexia, obesity and decompensated cardiac disease, and to increase protein intake in old people. Five illustrative cases are reported. Data are presented showing the proximate, mineral, vitamin and amino-acid content of Krallex and its effect on rat growth when replacing casein in the diet.—F. C. Aitken.

5270

JONXIS, J. H. P. and HUISMAN, T. H. J. **De uitscheiding van aminozuren in vrije en gebonden vorm tijdens de intraveneuze toediening van eiwithydrolysaat. [Excretion of**

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amino-acids, free and bound, during intravenous administration of protein hydrolysate.] *Nederland. Tijdschr. Geneesk.*, 1954, **98**, 1613-1621. [Kinderclin., Acad. Ziekenhuis, Groningen.] English summary.

Studies were made with a papain hydrolysate of milk protein at the rate of 1 to 2 g. per kg. body-weight in 2.5 or 5.0 per cent. solution. Each solution was tested on a group of 5 children between 3 months and (roughly) 9 years of age to whom it was given intravenously over 24 hr.; and on groups of 5 patients of about 30 kg. weight, to whom it was given over 6 hr. In the 24-hr. test, on the average 5 per cent. of the free α -amino-N given in the 2.5 per cent. solution was excreted; with the 5 per cent. solution, about 8 per cent. was excreted. Of bound α -amino-N given approximately 16 and 24 per cent. was excreted. In the 6-hr. test also more peptide N than free amino-N was excreted. In a patient with rickets given the 24-hr. test before and after treatment, only the excretion of free amino-acid was reduced by treatment. The results of chromatography on resin of the hydrolysate and of the urine of one child of 4 years are shown, and histidine and arginine were estimated in blood and urine before and after a 24-hr. infusion. Chromatography showed that the free acids lost in greatest proportion were threonine, serine and histidine; in bound form losses of tyrosine, phenylalanine, histidine and lysine were relatively greatest. The losses of individual bound acids were not closely related to the amounts in the hydrolysate.

I. Leitch.

5271

- ROBINSON, C. **Diets restricted in fat.** *J. Clin. Nutr.*, 1954, **2**, 47-49. [Dept. Food Nutr., Drexel Inst. Technol., Philadelphia, Pa.]

5272

- SINGLETON, W. S. and BENERITO, R. R. **Surface phenomena of fats for parenteral nutrition.** *Federation Proc.*, 1954, **13**, 298. [S. Reg. Res. Lab., Bur. Agric. and Indust. Chem., U.S. Dept. Agric., New Orleans, La.]

See also Abst. 4884.

DIABETES

5273

- LOPIS, S. **The management of the diabetic patient.** *S. African Med. J.*, 1954, **28**, 333-338. [Dept. Med., Univ. Witwatersrand.]

5274

- JACOBI, H. G. (with KAUFMAN, M. and OGATA, T.) **Nutritional studies of juvenile diabetics attending summer camp.** *J. Clin. Nutr.*, 1954, **2**, 22-31. [111 E. 80th St., New York 21.] Spanish summary.

The subjects were 74 boys and 81 girls aged 5 to 17 years. The boys tended to underweight and the girls to overweight; both tended to be tall for their age. At the end of the camp stay 40 per cent. of boys and 37 per cent. of girls had gained weight; 46 per cent. of boys and 45 per cent. of girls had lost weight.

The carbohydrate, protein and fat contents and energy values of the 5 diets prescribed in the camp are tabulated. Average intakes of energy per kg. bodyweight are given for boys and girls of different age groups. About 43 per cent. of boys and 25 per cent. of girls required an increase of food allowance during their stay. Changes in insulin dosage are recorded.

The organisation of these camps has already been described (Abst. 2408, Vol. 24).—F. C. Aitken.

5275

- PLANCHEREL, P. and MOESCHLIN, S. **Über die Verträglichkeit der Fructose bei Diabetes mellitus.** [Tolerance of fructose in diabetics.] *Schweiz. med. Wochenschr.*, 1954, **84**, 28-31. [Med. Klin., Univ. Zürich.] English summary.

Thirty-two patients with stabilised diabetes were given as additional carbohydrate from 16 to 150, but usually 100, g. fructose daily, distributed over the day, for from 4 to 50 days. Before administration of fructose the amount in the urine ranged from 0 to 15, and afterwards from 0 to 205 mg. per cent. In 6 of the patients there was a tendency for the values for total sugar in the blood to rise,

but in 3 of them intercurrent infection was responsible; of the other 3, one was not very well stabilised, in one the rise was temporary, and in the third it was very slight. Fructose disappeared very rapidly from the blood. Glycosuria occurred in 6 patients, of whom 4 were the same as those just mentioned. The insulin requirement was not increased by giving fructose; in 7 the daily dose of insulin could be reduced.

The verdict of von Noorden (*Die Zuckerkrankheit und ihre Behandlung*, Berlin, 1917; 1927), that prolonged consumption of fructose led to deterioration in the diabetic state, could not be confirmed.—E. M. Hume.

5276

- SCHÖNBERG, W. D. v. **Die Kaliumtherapie im Coma diabeticum.** [Potassium treatment in diabetic coma.] *Deutsch. med. Wochenschr.*, 1954, **79**, 587-589. [Allg. Krankenhaus St. Georg, Hamburg.]

A review.

5277

- FUTCHER, P. H. and LONG, N. W. (Jr.) **Hospital data on the birth of large infants to "prediabetic" women.** *Bull. Johns Hopkins Hosp.*, 1954, **94**, 128-138. [Dept. Med., Sch. Med., Johns Hopkins Univ., Baltimore, Md.]

Data are presented for 98 pregnancies in 46 mothers in whom diabetes was first diagnosed 2 or more years after the pregnancy. The mean weight and length of the 98 infants at birth were significantly greater than in control groups. The greater weight was not attributable to prolonged gestation. Obesity and relatively high parity were frequently associated with the birth of heavy infants.—F. C. Aitken.

GASTRO-INTESTINAL CONDITIONS

5278

- ROSS, C. A. C. and DAWES, E. A. **Resistance of the breast-fed infant to gastro-enteritis.** *Lancet*, **266**, 1954, 994-998. [Dept. Infect. Dis., Univ. Glasgow.]

The 3 strains of *Bacterium coli* used showed negligible growth in synthetic medium at pH below 5 and optimum growth at pH above 7. Tests with one strain showed that at pH 7.1 good growth was obtained in sterile faeces from a breast-fed infant, an infant fed on dried milk and an infant with gastro-enteritis. The pH of faeces from infants with gastro-enteritis ranged from 6 to 9, which is approximately the pH level of healthy artificially-fed infants and is much higher than that of wholly breast-fed infants. Formic acid, which is toxic to *Bact. coli* at low pH, was present in much higher concentrations in the faeces of breast-fed than of artificially-fed infants.

When lactose was given by mouth to 18 babies fed on dried milk the mean pH of the faeces fell from 7.7 to 5.7 in 15.4 days. The lowest levels were maintained for only a few days and pH rose again while the infants were being given lactose.

F. C. Aitken.

5279

La diarrhée. Quelques aspects de ce symptôme. [**Diarrhoea. Some aspects of this symptom.**]

Acta gastro-enterol. belg., 1954, 17, 299-518.

A review symposium which includes diet as a cause and in treatment.

5280

LINDÉN, L. Steatorrhé. [**Steatorrhoea.**] *Nord. Med.*, 1954, 51, 446-449. [Akad. Sjukhus., Upsala.] English summary.

5281

WOLF, S. A critical appraisal of the dietary management of peptic ulcer and ulcerative colitis. *J. Clin. Nutrit.*, 1954, 2, 1-4. [Dept. Med., Sch. Med., Univ. Oklahoma, Oklahoma City.]

Helping to allay anxiety and tension in the patient is thought to be more fruitful than diet treatment in the management of peptic ulcer and ulcerative colitis.—F. C. Aitken.

5282

MEURLING, S. Postcibal symptoms after partial gastrectomy for peptic ulcer. *Acta Soc. Med. upsalien.*, 1953, 59, Suppl. 3, pp. 127. [Surg. Clin., Royal Academic Hosp., Univ. Upsala.]

Details are given of a clinical study of 624 patients who had undergone partial gastrectomy. Dietetic treatment for those affected, 31.3 per cent., consisted in giving small dry meals with fluids between times, the meals being taken when possible with the patient lying down, and in the exclusion from the diet of foods found by trial to produce discomfort. Milk and milk products were frequently ill tolerated. For immediate post-operative treatment dry and solid food without milk is recommended.—L. Wills.

5283

BUTLER, T. J., CAPPER, W. M. and NAISH, J. M. Ileo-jejunal insufficiency following different types of gastrectomy. *Gastroenterologia*, 1954, 81, 104-108 (with discussion 108-109). *Proc.* [Bristol.]

5284

VAN DE KAMER, J. H., WEIJERS, H. A. and DICKE, W. K. Coeliac disease. 4. An investigation into the injurious constituents of wheat in connection with their action on patients with

coeliac disease. *Acta paediat.*, 1953, 42, 223-231. [Central Inst. Nutrit. Res. T.N.O., Utrecht.] French, German and Spanish summaries.

[This paper appeared in No. 1 of this volume, by title only: Title 1189. It should obviously have been abstracted at that time.]

Gluten from blended Dutch wheat, 4 varieties, was fractionated and the several fractions were tested on a child who reacted in 3 to 6 hr. to very small amounts of gluten with acute abdominal pain, vomiting and slight signs of shock. There was no sensitisation as judged by intracutaneous injection of wheat extract.

Ash, crude fibre and fat of wheat, like wheat starch, produced no reaction and gluten only a slight reaction. Gliadin gave a severe reaction, as did also an aqueous extract of the gluten which contained gliadin, but not an extract with 10 per cent. NaCl which contained no gliadin.

Further tests on 5 children with faecal fat as the indicator confirmed the injurious effect of wheat gliadin. Tests on one child with oatmeal showed that its effect was the same as that of wheat.

I. Leitch.

5285

RAGAZZINI, R., BARTOLOZZI, G. and PRATESI, E. "Il morbo celiaco". Descrizione di due casi. Considerazioni patogenetiche e terapeutiche con particolare riguardo al "fattore frumento". [**Coeliac disease. Account of two cases. Pathology and treatment with special reference to the wheat factor.**] *Riv. Clin. pediat.*, 1953, 52, 223-250. [Clin. Pediat., Univ. Florence.]

A general account is given of coeliac disease, followed by a description of 2 cases with full laboratory findings. One of the patients, a boy of 4 years, was given first the usual treatment and then the dietary treatment of Dicke *et al.* (Absts. 5091, Vol. 23; 5284, Vol. 24) by which all wheat products are withheld. The favourable experience of the Dutch workers was fully confirmed. Measurements of absorption of fatty acids showed the percentage absorbed to be 66 with the first diet and 88 and 92 on two occasions with the wheat-free diet.—E. M. Hume.

5286

ANDERSON, C. M., FRAZER, A. C., FRENCH, J. M. HAWKINS, C. F. ROSS, C. A. C. and SAMMONS, H. G. The influence of gluten and anti-bacterial agents on fat absorption in the sprue syndrome. *Gastroenterologia*, 1954, 81, 98-103 (with discussion 103). *Proc.* [Birmingham.]

5287

SHARP, G. S. and HAZLET, J. W. Evaluation of a new method for supplementation of gastric

hydrochloric acid. *Amer. J. Digest. Dis.*, 1954, **21**, 140-144. [Pasadena Found. Med. Res., Calif.]

A new preparation is described for easy administration of HCl in quantities sufficient to ensure active digestive function. Experience from its use on 104 achlorhydric patients showed that many functional digestive complaints and dietary intolerances could be relieved. The preparation, Normacid (Stuart Co., Pasadena), gradually disintegrates, releasing HCl over a time interval comparable with the physiological secretion by the normal stomach, as was shown by a series by X-ray photographs taken at 15-min. intervals after swallowing the tablet. Each tablet contains betaine hydrochloride 440 mg., methyl cellulose 110 mg. and pepsin (1 to 10,000) 32.4 mg. It is recommended that all patients over 60 years who have digestive complaints referred to the epigastrium should be tested for gastric acidity, and that those with achlorhydria or hypochlorhydria should, if no neoplasm is present, be given this new treatment.—M. B. Richards.

See also Absts. 4932, 5191, 5197, 5226.

THYROID DISEASE

5288

GREENWALD, I. **Cabbages and turnips as a cause of endemic, or epidemic, goiter.** *Federation Proc.*, 1954, **13**, 459. [Coll. Med., Univ. New York.]

5289

HOBSON, Q. J. G. **Some nutritional aspects of thyroid disease.** *Nutrition*, 1954, **8**, 11-17. [W. Middlesex Hosp.]

5290

CABEZAS, A. **Comentarios sobre un tratamiento experimental del bocio endémico. [Notes on the experimental treatment of endemic goitre.]** *Sanidad en El Salvador*, 1951, **2**, 325-326.

5291

WILSON, H. T. and MAIER, E. C. **The protein-bound iodine as a guide in thyroid therapy.** *J. Lab. Clin. Med.*, 1954, **43**, 422-426. [Clin. Lab., San Bernardino, Calif.]

5292

CLEMENTS, F. W. **Endemic goitre in Australia, New Zealand, and Melanesia.** *Bull. World Health Organiz.*, 1954, **10**, 105-111. [Inst. Child Health, Univ. Sydney, N.S.W.] French summary.

New South Wales, South Australia, Tasmania, Victoria and possibly parts of North Queensland are areas where goitre is endemic. In 1947 iodine prophylaxis was introduced. Ten-mg. tablets of

KI were given weekly to pregnant and lactating women and to infants, children and adolescents. Since 1947 the incidence of goitre in Canberra schoolchildren of 9 to 11 years of age has fallen and in 1952 was negligible. In West Australia endemic goitre has not been recorded although other trace-element deficiencies occur there. Practically the whole of Tasmania is an endemic-goitre region, the incidence being greatest in the south of the island.

In New Zealand as a result of iodine prophylaxis started in 1924 large visible goitres have almost disappeared, but the incidence of palpably enlarged goitres is still high. This may be partly explained by the fact that only 80 per cent. of the population use iodised salt, some of which is insufficiently iodised.

In New Guinea the distribution of goitre is irregular. Non-goitre areas are in close proximity to areas where more than half of the men and almost all the women have enlarged thyroids. The crude salt in use in Melanesia can now be iodised and a campaign to educate the people in its use has every chance of success, as salt, one of the chief substances used in barter, is in great demand.—B. W. Simpson.

5293

KOPF, H. **Neure Behandlungsergebnisse kropf-behafteter Neugeborener und Schulkindern in Oberösterreich. [Recent results of treatment for goitre of newborn infants and schoolchildren in Upper Austria.]** *Wien. klin. Wochenschr.*, 1954, **66**, 96-98. [Chirurg. Abt., Krankenhaus Barmherzigen Schwestern, Linz/Donau.]

In Vöcklabruck, treatment of the mother with KI, preferably from the 4th month of pregnancy, reduced the percentage of goitre in the newborn from 47 to about 5, in 2 years. In Rohrbach, notorious for its high incidence of goitre, the attempt has been made for the last few years to give 0.5 mg. KI weekly to every schoolchild, and consumption of iodised salt in the homes has been encouraged. The percentage of schoolchildren with goitre was 66 in 1946, compared with 31 in 1952 after only 2 years' attempted prophylaxis. As further evidence of the beneficial effect of I, the figures are given for Bad Hall, which has drinking water with the highest I content in Austria. The percentage of schoolchildren with goitre is about 11 for those living in Bad Hall but 35 for those nearby and outside; in the region of Steyr, for instance, it is 49. The fact that 11 per cent. of the Bad Hall children have goitre despite the high I intake is taken as evidence that I deficiency is not quite the whole story and that some other condition such as a further dietary deficiency, a toxin or bad hygiene does play some part.—E. M. Hume.

5294

WILSON, D. C. **Goitre in Ceylon and Nigeria.** *Brit. J. Nutrition*, 1954, **8**, 90-99. [Lab. Human Nutrit., Univ. Oxford.]

In the wet areas of Ceylon the percentage incidence of goitre among girls was very high and among boys moderate, but in the dry areas the incidence was generally low for both sexes. The chief condition affecting the incidence of goitre was the high-carbohydrate low-protein diet of the poorer villagers living in the wet areas where the I content of the water was low. Six samples of rural drinking water had low amounts ranging from 1.4 to 2.7 μg . I per litre, and there was much faecal pollution. In Nigeria there was a high percentage of goitre with cretinism and deaf-mutism among families living on the pre-Cambrian granites and using water with a low I content of 0.6 to 0.7 μg . per litre. Those living on basaltic areas were free from goitre and the water in these areas had 5 μg . I per litre. The marine sedimentary regions of the Niger basin were free from goitre.

It is concluded that in the goitre areas of Ceylon and Nigeria lack of I in food and water is of primary etiological importance.—B. W. Simpson.

5295

PINEDA, T. **Nuevos datos sobre la incidencia del bocio endémico en El Salvador.** [New data on the incidence of endemic goitre in El Salvador.] *Sanidad en El Salvador*, 1951, **2**, 318-322.

5296

CABEZAS, A., PINEDA, T. and SCRIMSHAW, N. S. **El bocio endémico en los niños de las escuelas de El Salvador.** [Endemic goitre in school-children in El Salvador.] *Bol. Ofic. sanit. panamer.*, 1953, Suppl. 1, 22-26. [Inst. Nutrición de Centro América y Panamá, Guatemala.]

Over 32,000 children, representing 5 per cent. of the school population and about 2 per cent. of the total population, were examined in all the Department capitals and in some other towns in the 14 other departments of El Salvador.

In the capital, San Salvador, about 8000 children were seen and on the findings it was estimated that out of a total school population of 673,000 children, about 119,000 were suffering from endemic goitre.

The incidence of visibly enlarged thyroids was low, about 6.2 per cent. of the total cases seen. No deaf-mute, idiot or cretin was seen.

The salt used in El Salvador is entirely sea-salt with a mean I content of 0.22 and a maximum of 0.57 parts per 10,000. It is recommended that iodisation of all salt intended for human consumption be started immediately to bring the content up to 1 part per 10,000.

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With the possible exception of a general dietetic deficiency of vitamin A, no goitrogenic abnormality of diet was seen.—P. C. Jowsey.

5297

MUÑOZ, J. A. **Informe preliminar sobre bocio endémico en Guatemala.** [Preliminary notes on endemic goitre in Guatemala.] *Rev. Col. Méd., Guatemala*, 1951, **2**, 23-28.

5298

SCHWARTZMAN, J. **Testosterone. A study of its effect upon anorexia and underweight in children. Review of 19 cases.** *Arch. Pediat.*, 1954, **71**, 99-110. [1747 W. Second St., Brooklyn.]

Children with chronic idiopathic anorexia and underweight, ranging in age from 6 months to 10 years, were given 25 mg. aqueous testosterone propionate, intramuscularly, twice weekly for 4 weeks. Increased appetite and weight gain occurred in all.—F. C. Aitken.

ANAEMIA

5299

COLES, B. L. and JAMES, U. **The effect of cobalt and iron salts on the anaemia of prematurity.** *Arch. Dis. Childhood*, 1954, **29**, 85-96. [Dept. Paediat., Elizabeth Garrett Anderson Hosp., Royal Free Hosp. Group, London.]

In all, 126 premature infants were studied, of which 83 were followed for 6 months or longer. The infants were divided at random into 4 groups: group 1 acted as controls; group 2 received 10 mg. cobalt sulphate by mouth daily from the first to the twelfth day of life; group 3 received 20 mg. by mouth daily from 4 to 8 weeks of age; group 4 received 20 mg. with $4\frac{1}{2}$ grains FeSO_4 daily from 4 to 8 weeks. Hb and red cell counts were estimated at intervals from birth. Indications for further treatment were Hb values below 70 per cent., or 75 per cent. at 6 to 7 months, when FeSO_4 was given and red cell counts below 2.5 million, when cobalt sulphate was given.

Administration of Co had little modifying effect on the fall in Hb and red cell count in the first 2 weeks of life. From 2 months of age groups 2 and 3 combined had significantly higher Hb values and red cell counts than groups 1 and 2 combined. Hb values of group 4 remained significantly higher than in any other group after the age of 4 months. None of the group 4 infants required additional treatment. Of the 14 infants requiring additional Fe treatment 8 were controls and groups 2 and 3 had 3 each. All the 4 infants requiring Co treatment were in the control group.

Data are presented showing the incidence of breast feeding and the average weight gains in the groups.—F. C. Aitken.

5300

- PETT, L. B. **Anemia apparently induced by bone-meal enriched flour.** *Federation Proc.*, 1954, 13, 473. [Dept. Nat. Health Welfare, Ottawa.]

5301

- LEONARD, B. J. **Hypochromic anaemia in R.A.F. recruits.** *Lancet*, 1954, 266, 899-902. [Royal Air Force Hosp., West Kirby, Cheshire.]

Routine examination of blood of 4221 recruits revealed 50 with hypochromic anaemia but showing no sign; in 2 men there had been haemorrhage from the gastro-intestinal tract and in 1 acholuric jaundice; the remaining 47 cases were classified as idiopathic. Most of the men came from families belonging to social class IV or V of the Registrar-General's classification. In 20 the Hb was under 10.4 g. per 100 ml. blood. The mean corpuscular Hb was low but microcytosis was not prominent. Bone marrow examination showed hyperplastic marrow in 31; in the others it was normal. The degree of hyperplasia corresponded roughly with the degree of anaemia. Test meal examination showed histamine-fast achlorhydria in 43 per cent. of all cases, an incidence similar to that found in middle-aged anaemic women. In 13 patients repeat tests made after treatment showed that free acid had returned in 6. Treatment was with intravenous Fe, 25 mg. saccharated iron oxide for every 1 per cent. that Hb was below normal. The average daily increase in Hb was 0.34 g. at 10 days and 0.19 g. at 4 weeks; the preparation was fully utilised. After treatment the men had a feeling of increased wellbeing, were more energetic and had a greater interest in life.—L. Wills.

5302

- BEUTLER, E., DRENNAN, W. and BLOCK, M. **The bone marrow and liver in iron-deficiency anemia. A histopathologic study of sections with special reference to the stainable iron content.** *J. Lab. Clin. Med.*, 1954, 43, 427-439. [Dept. Med., Univ. Chicago, Ill.]

Detailed studies were made of bone marrow smears and sections from 23 patients with uncomplicated Fe-deficiency anaemia before and after treatment and from 12 normal subjects. The marrow from the Fe-deficient subjects was generally more cellular and contained more erythroblasts than did that of the controls, but in both groups the variability was such that the marrow picture cannot be considered as diagnostic. Though there was no correlation between the degree of anaemia and the degree of erythroblastic hyperplasia in untreated patients, the increase in the degree of hyperplasia found after treatment was roughly related to the initial degree of anaemia. In marrow sections stained for Fe none was detected in material from untreated Fe-deficient patients;

it was present in the marrow of normal subjects. After either prolonged treatment with Fe by mouth, in some cases only after 12 months, or adequate therapy by vein, stainable Fe appeared in the marrow tissue. Sections stained with haematoxylin-eosin-azure showed greenish granules resembling haemosiderin in marrows which by the specific Fe test contained none. Liver biopsies were made on a few patients; before treatment no Fe was demonstrated in the tissue but after Fe by vein it was found, storage taking place apparently in the Kupffer cells. To replenish the body stores of Fe treatment by mouth is necessary long after the blood picture has become normal.—L. Wills.

5303

- MURPHY, W. P. **Pernicious anemia as a problem in geriatrics.** *Geriatrics*, 1954, 9, 99-105. [Dept. Med., Peter Bent Brigham Hosp., Boston, Mass.]

Previous work is reviewed and it is pointed out that in the United States the death rate from pernicious anaemia fell from 5.8 per 100,000 in 1925 to 1.0 in 1948. In a series of 200 living patients 84 per cent. were over 60 years of age and many had survived 19 or more years since diagnosis was made and had led normal, active lives. There was no evidence that the administration of liver had increased the incidence or severity of arteriosclerotic changes, which, as in others of the same age group, were frequently present. The most common causes of death of patients with pernicious anaemia were cardiovascular and malignant disease; the latter affected the stomach in particular, but its development was influenced by the age of the patients rather than by the presence of pernicious anaemia.—L. Wills.

See also Absts. 4906, 5198, 5199, 5201, 5202, 5216, 5218.

OTHER CONDITIONS

5304

- STAUB, H. **Physio-pathologie et diététique de l'hypertension. [Physiopathology and dietary treatment of hypertension.]** *Schweiz. med. Wochenschr.*, 1954, 84, 1-7. [Clin. Méd., Univ. Basle.]

5305

- TRÉMOLIÈRES, J. and LYON, L. **Les régimes pauvres en sodium dans l'hypertension. Indications. Réalisations pratiques. [Low-sodium diets in hypertension. Indications. Practical results.]** *Diététique et Nutrition*, 1954, 5, 19-31. [Groupe Études Métabol., Sect. Nutrit., Inst. Nat. Hyg., Paris.]

The metabolic effects of diets low in Na and their clinical effects in hypertension are outlined

and the type of diet to be used in different forms of hypertension is discussed. Practical suggestions for rendering the diets palatable are made. Two main diets to provide 1500 and 2300 Cal., respectively, with adjustments to suit different cases, are given, with indications how they may be distributed over the different meals of the day, and a week's menus for the 1500-Cal. diet. Lists of foods to be avoided, to be limited in quantity, or to be given freely, are included.—M. B. Richards.

5306

FINZI, M. Indicazioni pratiche sul "regime di riso, zucchero e frutta" nella terapia dell'ipertensione arteriosa e dell'insufficienza cardiaca. [Practical observations on the "rice, sugar and fruit diet" in the treatment of arterial hypertension and cardiac insufficiency.] *Acta gerontol.*, 1953, 3, No. 5-6, 28-33. [Bologna.]

The rice should preferably be whole, or supplemented with B vitamins and Fe; supplements of vitamin B₁₂ and liver will prevent the complication of anaemia.

Unsalted diet is unappetising and must be faced with patience and resignation, which will be rewarded by physical and psychological improvement.—I. Leitch.

5307

HATCH, F. T. (with ENGLISH, S. A.) Effects of withdrawal and restoration of dietary sodium chloride upon urinary electrolytes in patients with hypertension. *Metabolism*, 1954, 3, 160-167. [Res. Serv., First (Columbia) Div., Goldwater Mem. Hosp., New York.]

The patients studied were, in general, severely ill with hypertensive cardiovascular disease. Serum and urine electrolytes were estimated and body-weight and blood pressure were measured in 11 patients for 1 or 2 weeks during which they received a low-salt diet providing approximately 40 m. equiv. Na, 100 m. equiv. Cl and 80 m. equiv. K daily. The patients were then given the Kempner rice diet which reduced Na and Cl intakes to 4 and 10 m. equiv., respectively, without reduction of K intake, and observations were continued for 5 weeks. Change to the rice diet resulted in marked decreases of urinary excretion of Na and Cl with little change in serum levels. On the average bodyweight declined slightly and blood pressure declined. Estimated decreases in total body Na and Cl during the 5 weeks ranged from 30 to 480 m. equiv. Na and 70 to 620 m. equiv. Cl.

Four patients who had undergone prolonged restriction of NaCl intake, 3 of them on the rice diet, were given tablet supplements of 8.5 or 17 m. equiv. NaCl daily for several weeks. Part or all of the

Cl supplement rapidly appeared in the urine, but excretion of Na remained low for 4 to 5 weeks.

F. C. Aitken.

5308

SCHWARTZ, W. B. and RELMAN, A. S. Electrolyte disturbances in congestive heart failure: clinical significance and management. *J. Amer. Med. Assoc.*, 1954, 154, 1237-1241. [Pratt Diagnost. Clin., New England Centre Hosp., Boston, Mass.]

A brief outline is given of the pathogenesis, diagnosis and clinical management of disturbances of electrolyte metabolism which have been observed to arise spontaneously or as a result of treatment in patients with oedema of cardiac origin. These include alkalosis, acidosis, low-salt syndrome, potassium depletion and ammonium chloride poisoning.—F. C. Aitken.

5309

WOLFFE, J. B. Atherosclerosis. A review of its complications and management. *Geriatrics*, 1954, 9, 211-222. [Dept. Med., Valley Forge Heart Inst., Fairview Village, Pa.]

5310

PENNINGTON, A. W. Treatment of obesity: developments of the past 150 years. *Amer. J. Digest. Dis.*, 1954, 21, 65-69. [Med. Div., E.I. du Pont de Nemours and Co., Wilmington, Del.]

5311

SIMMONS, W. D. The group approach to weight reduction. 1. A review of the project.

SUCZEK, R. F. 2. Psychologic aspects of obesity and group weight reduction.

WALSH, H. E. 3. As the nutritionist sees it. *J. Amer. Dietetic Assoc.*, 1954, 30, 437-441; 442-446; 447-449. [Dept. Res., Herrick Mem. Hosp., Berkeley.]

5312

EVERS, J. Diättherapie bei Dystrophia musculorum progressiva (Erb). [Diet treatment in Erb's progressive muscular dystrophy.] *Münch. med. Wochenschr.*, 1954, 96, 41. [(21b) Hachen, Kreis Arnsberg, Westf.]

Case histories are given of 2 children aged 11 and 15 years who were completely cured by the author's diet treatment, details of which can be obtained from him.—E. M. Hume.

5313

HUGHES, E. C., LLOYD, C. W., JONES, D., LOBOTSKY, J., RIENZO, J. S. and AVERY, G. M. Some recent observations concerning the toxemias of pregnancy. *Amer. J. Obstet. Gynecol.*, 1954,

67, 782-797 (with discussion 797-800). *Proc. [Dept. Obstet., State Univ. New York Med. Centre, Syracuse.]*

5314

BICKEL, H., GERRARD, J. and HICKMANS, E. M. **The influence of phenylalanine intake on the chemistry and behaviour of a phenylketonuric child.** *Acta paediat.*, 1954, **43**, 64-77. [Dept. Paediat., Univ. Birmingham.] French, German and Spanish summaries.

Treatment of the child with a diet low in phenylalanine resulted in improvement in mental condi-

tion and a fall in phenylalanine levels in blood and urine. After 11 months 4 g. L-phenylalanine were given daily, whereupon there was an immediate deterioration in mental condition and a rise in phenylalanine levels. Return to phenylalanine restriction resulted in improvement in the child's condition. Administration of 4 g. L-phenylalanine was well tolerated in a normal control child.

The preparation of the diet, the basis of which was a phenylalanine-free casein hydrolysate, is described.—F. C. Aitken.

See also Absts. 4587, 4791, 5173, 5174, 5176, 5246, 5247.

6. FEEDING OF ANIMALS

GENERAL, INCLUDING DIGESTIBILITY TRIALS

5315

DUCKWORTH, J. **The feeding of livestock.** *J. Roy. Agric. Soc. Engl.*, 1953, **114**, 134-143. [Rowett Res. Inst., Bucksburn, Aberdeenshire.]

5316

WELSH, M. and TENNISON, L. B. **Advances in animal nutrition.** *Vet. Med.*, 1954, **49**, 191-196. [Pearl River, N.Y.]

5317

STAMPA, S. Ein Beitrag zur Futterverwertung, mit kritischer Verarbeitung bisheriger Versuchsergebnisse. [Estimating feeding value, with a critical review of earlier experimental results.] *Arch. Tierernährung*, 1953, **3**, 360-388. [Inst. Tierzucht, Justus Liebig Hochsch., Giessen.]

A review.

5318

SONI, B. K., MURDOCK, F. R., HODGSON, A. S., BLOSSER, T. H. and MAHANTA, K. C. **Diurnal variation in the estimates of digestibility of pasture forage using plant chromogens and fecal-nitrogen as indicators.** *J. Animal Sci.*, 1954, **13**, 474-479. [State Coll. Washington.]

Six Holstein heifers and 3 wethers, grazing pasture, were used in this study for a 4- and 3-day collection period, respectively. Total collections of faeces were made from the wethers and samples were taken 3 times during each 24-hr. period. With the heifers grab samples were taken. Diurnal variation in faecal N was small but faecal chromogen varied widely and irregularly. With the formula of Reid *et al.* (Abst. 1622, Vol. 22), in which the chromogen content of the forage is not estimated directly, the coefficients of digestibility were very uniform. The average coefficient and

standard deviation for sheep by the chromogen technique was 70.8 and 2.89, and by the faecal N technique 70.4 and 3.08. The results by both methods showed no diurnal variation in digestibility.—D. M. Walker.

5319

SCHNEIDER, B. H., SONI, B. K. and HAM, W. E. **Digestibility and consumption of pasture forage by grazing sheep.** *J. Animal Sci.*, 1953, **12**, 722-730. [State Coll. Washington.]

Three adult rams, 3 yearlings and 3 lambs were grazed on permanent pasture at the bloom, seed and second cutting stage. Digestibility was not affected by age of the animal, but significant differences were found by the chromogen method between the bloom stage 64.4, the seed stage 57.6 and the second cutting stage 56.2. Dry matter eaten daily was 0.8, 1.7 and 2.2 lb. per 100 lb. bodyweight for the rams, yearlings and lambs, respectively. The results agree with those computed from the N content of the faeces but not with those from the T.D.N. requirement.

J. C. Gill.

5320

RAYMOND, W. F. **Studies in the digestibility of herbage. 3. The use of faecal collection and chemical analysis in pasture studies: (a) ratio and tracer methods.**

RAYMOND, W. F., KEMP, C. D., KEMP, A. W. and HARRIS, C. E. **4. The use of faecal collection and chemical analysis in pasture studies: (b) faecal index methods.** *J. Brit. Grassland Soc.*, 1954, **9**, 61-67; 69-82. [Grassland Res. Inst., Hurley, Berks.]

3. Techniques which use feed:faecal ratios or indigestible tracers to predict herbage intake and digestibility by grazing animals are discussed and criticised. Chromic oxide and plant tracers such

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as lignin and chromogen are of value only if the sample of herbage analysed is similar to that grazed in the field. Animals tend to select the better quality of herbage and, therefore, plant tracers will underestimate both digestibility and the intake. Lignin and chromogen are criticised on the basis of their digestibility in some circumstances and the diurnal variation in the excretion pattern limits the value of "grab" samples of faeces. Methods based on faecal composition alone appear to be of most value and these are discussed.

4. Using the cold-storage technique described in a previous paper (Abst. 3834, Vol. 24), 40 feeds were given to groups of sheep in metabolism cages and the faeces were analysed for "macerate crude fibre", nitrogen and chromogen. Regression equations relating the digestibility of dry matter and organic matter to the above variables are given. The accuracy of these equations when applied in practice is limited, owing to the wide range of feeds tested, the individual digestive abilities of the sheep and the small number of animals in any one group. The equations obtained in these experiments relating faecal composition (chromogen and nitrogen) to herbage dry matter digested were not in agreement with those of Reid *et al.* (Abst. 1622, Vol. 22) and Lancaster (Abst. 1427, Vol. 19). It is suggested that chromogen measured at 415 m μ , at the peak of the absorption curve, may be a more reproducible value from station to station than that at 406 m μ now in use, which is on the slope of the absorption curve. Analyses for N should be on wet faeces.—D. M. Walker.

5321

BRANNON, W. F., REID, J. T. and MILLER, J. I. **The influence of certain factors upon the digestibility and intake of pasture herbage by beef cattle.** *J. Animal Sci.*, 1953, 12, 938. *Proc.* [Cornell Univ.]

5322

DAVIS, R. F., LOOSLI, J. K. and GRIPPIN, C. H. **The effect of texture on the digestibility of oats and a mixed concentrate by ruminants.** *J. Animal Sci.*, 1953, 12, 913. *Proc.* [Cornell Univ.]

5323

CHARLET-LERY, G., FRANCOIS, A. C., LEROY, A. M. and VACHEL, J. P. Influence de l'aureomycine sur l'utilisation digestive des aliments par le porc. [Effect of aureomycin on feed digestion by pigs.] *Ann. Zootec.*, 1954, 3, 1-7. [Lab. Recherches Zootech., Inst. Nat. Agronom., Paris.]

The addition of 20 mg. aureomycin per kg. feed to a ration of barley, cassava, oats, soya bean

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cake, meat meal, distiller's yeast, linseed cake and alfalfa meal did not affect the digestibility of the dry matter, organic matter, N, fat, cellulose or N-free extractives. The experiments were made on pigs over two 10-day periods.—T. D. Bell.

5324

TILLMAN, A. D., CHAPPEL, C. F., SIRNY, R. J. and MACVICAR, R. **The effect of alfalfa ash upon the digestibility of prairie hay by sheep.** *J. Animal Sci.*, 1954, 13, 417-424. [Dept. Animal Husb., Oklahoma Agric. Exp. Stat.]

Results of 2 digestibility trials showed that the apparent digestibility of a prairie hay basal ration for sheep was not increased by the addition of a complete mineral mixture or by the addition of alfalfa ash. In the first trial the hay was given with natural feedingstuffs and in the second the hay was the only natural feedingstuff in a semi-purified diet. The trials, run over a series of 6 consecutive 3-day collection periods, indicated that a 3-day collection period was too short for an accurate measure of apparent digestibility.

J. C. Gill.

5325

FRANCOIS, A. C., LEROY, A. M. and ZELTER, S. Z. **Processus digestifs des ruminants. 2. Influence des antibiotiques sur la digestibilité in vitro du foin de luzerne. [Digestion in the ruminant. 2. Effect of antibiotics on digestibility of alfalfa hay in vitro.]** *Ann. Zootec.*, 1954, 3, 9-16. [Lab. Recherches Zootech., Inst. Nat. Agronom., Paris.]

Using the technique previously described (Fouconneau *et al.*, *Ann. Zootec.*, 1953, 2, 275) experiments were made *in vitro* to investigate the effects of antibiotics on the digestibility of alfalfa hay. The antibiotics were aureomycin, the Na, K and procaine salts of penicillin, dihydrostreptomycin, didromycin, streptomycin sulphate, and bacitracin. Apart from aureomycin, the amount of which varied from 9.5 to 76 mg. per kg. dry matter of the hay, all were added at the rate of 76 mg. per kg. dry matter. Only aureomycin at all levels, and streptomycin, decreased the degree of breakdown of the carbohydrates, particularly cellulose, and the formation of volatile fatty acids. Procaine penicillin slightly increased the digestibility. All the other antibiotics investigated were without effect.—T. D. Bell.

5326

JOUBERT, L., FERRANDO, R. and GORET, P. **Inconvénients et dangers possibles des rations antibiotiques supplémentées. [Disadvantages and possible dangers of rations supplemented with antibiotics.]** *Rev. Méd. vét., Toulouse*, 1954, 105, 79-102.

5327

BREIREM, K. Kraftfôrblandinger. [Concentrate mixtures.] *Landbrukshøgsk. Inst. Husdyrernæring Fôringsslære*, Repr. No. 133, 1953, pp. 40.

The use of concentrates appears to date from about 1880 for oilcakes and a little later for herring meal. The first commercial mixtures were, possibly, made by a Danish firm on the advice of Professor Goldschmidt, in 1909. For more than 10 years later, commercial mixtures were discouraged. The advantages and risks of purchasing commercial mixtures are briefly discussed. There are now regulations and specifications which help to safeguard the buyer. The requirements in respect of specifications are next discussed and then the pros and cons of complex and simple mixtures, possible additions of vitamins and minerals (which may not always be appropriate or beneficial, as, for instance, the use of too much seaweed as a permissible source of iodine in deficiency areas), hormones and antibiotics. The addition of vitamins is often wasteful; for instance, the loss of vitamin A from cod liver oil in concentrates and of vitamin D in mineral mixtures. Supplements are often better given separately. The firm A/S Martens in Bergen has put on the market a molecular distillate of cod liver oil, in powder form, free from harmful unsaturated fatty acids, which is a useful and relatively stable source of vitamin A. Cod liver oil is not allowed in mixtures for pigs.—I. Leitch.

5328

JUON, P. Über die Eigenschaften des Hahnenfusses als Silofutter. 2. Beitrag zur Kenntnis von *Ranunculus acer* L. mit *R. Steveni* Hartm. [Properties of the buttercup as silage. 2. *Ranunculus acer*, L. with *Ranunculus steveni*, Hartm.] *Schweiz. Arch. Tierheilk.*, 1953, 95, 506–510. French, Italian and English summaries.

Molassed silage was made in a concrete pit silo from a natural meadow of which about half was buttercups in full bloom, probably *Ranunculus acer*, L. and *R. steveni*, Hartm., with *R. repens*. When the pit was opened 9 months later the silage was found to be of good quality, with normal colour, pleasant smell, pH 3.95, 2.2 per cent. lactic acid and no butyric acid. The silage was readily eaten by cows which had previously been on good A.I.V. grass-vetch silage, and there was no ill effect on the health or setback in yield or quality of milk. It was concluded that the toxic substance anemonol is destroyed and that grass mixed with buttercups may safely be used to make silage.

W. M. Deans.

5329

KOLOUŠEK, J., LAUTNER, V. and MÜLLER, Z. Příspěvek k poznání chemického složení a fyziologických vlastností kopřivy dvoudomé (*Urtica dioica*) ve vztahu k výživě hospodářských zvířat. [The chemical composition and physiological properties of the stinging nettle (*Urtica dioica*) with reference to its use as a feedingstuff.] *Sborn. čsl. Akad. Zéměd.* [4], 1953, 27, 113–144. English and Russian summaries.

From analytical data, including mineral, amino-acid and β -carotene content, and from the result of feeding experiments with chickens and rats, it is concluded that the stinging nettle has a high nutritive value, superior even to that of alfalfa. (From summary.)—J. S. Thomson.

5330

LEROY, A. M. and ZELTER, S.-Z. Recherches sur l'efficacité alimentaire des marcs de pomme fermiers. 1. Étude de la variabilité de composition chimique et de valeur nutritive de marcs de pomme fermiers frais. [The feeding value of cider apple residues. 1. Variation in chemical composition and nutritive value of fresh cider apple residues.] *Ann. Zootec.*, 1954, 3, 17–27. [Lab. Recherches Zootech., Inst. Nat. Agronom., Paris.]

The residues studied were from small cider presses on local farms. The installations and techniques on these farms are extremely varied, and this is reflected in the composition of the samples. Twenty-nine samples from 25 farms in 7 departments were analysed. Variety of fruit, method of pressing and district all have profound effect. Average figures for proximate composition, acidity, volatile fatty acids and calculated feeding value are given, but the range for each is great, and the value of the averages is doubtful. Possibly the residues could be a useful feed for livestock, but their high content of cellulose and pectic substances limits their application. Further investigations of their suitability will be made.

T. D. Bell.

5331

VANOSI, L. L'impiego dei residui della fabbricazione della birra nell'alimentazione del bestiame. [The use of brewery residues in animal feeding.] *Riv. Zootec.*, 1954, 27, 144–146.

A general article.

5332

HUSBY, M. (with GRANLY, Å. and LAKSEVELA, B.) Durra, johannesbrød og potetgropp som fôr. [Sorghum, carob and potato meals as feed.]

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Meld. Norges Landbrukskøbsk., 1953, No. 73, pp. 33. English summary.
See Abst. 5168, Vol. 23.

5333

BELL, M. C., GALLUP, W. D. and WHITEHAIR, C. K. **Value of urea nitrogen in rations containing different carbohydrate feeds.** *J. Animal Sci.*, 1953, **12**, 787-797. [Dept. Animal Husb., Oklahoma Agric. Exp. Stat.]

Three series of digestibility trials and N balance studies were made with Hereford steers which received a ration of prairie hay and one of the following carbohydrate feeds: ground maize, rolled barley, ground milo, dehydrated shredded sweet potatoes, molasses, and maize and molasses together. The protein content was adjusted to 7 to 8 per cent. with cottonseed meal or soya bean meal. In a second period urea was added to bring the protein equivalent to 10 to 12 per cent.

The addition of urea had little effect on the apparent digestibility of the nutrients other than that of crude protein, which was increased in all rations. N retention was also increased, the results being greater with maize as the carbohydrate feed than with molasses. Biological values of total N with urea present were of the same order with the different cereal grains and sweet potatoes in the ration, but urea N was utilised less efficiently when molasses was the source of carbohydrate.—W. Godden.

5334

BATTAGLINI, A. **Possibilità dell'impiego di urea nell'alimentazione del bestiame.** [The use of urea in stock feeding.] *Riv. Zootec.*, 1954, **27**, 116-117.

A brief review.

5335

VAN WYK, H. P. D. and HARWIN, G. O. **Urea as a protein supplement in livestock nutrition.** *Farming in S. Africa*, 1954, **29**, 207-208. [Coll. Agric., Potchefstroom.]

5336

Feed urea in ruminant nutrition. Literature abstracts and bibliography. Nitrogen Division, Allied Chemical and Dye Corporation, 40 Rector St., New York 6, pp. ix + 28; 150 Abstracts.

5337

NATIONAL RESEARCH COUNCIL, U.S.A., COMMITTEE ON ANIMAL NUTRITION. **Hormonal relationships and applications in the production of meats, milk and eggs.** Publication No. 266, March 1953, pp. iv + 54.

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Recommendations, based on a review of the literature, are made for the use of synthetic oestrogens and thyroid-active preparations for poultry fattening, egg production, and cattle, sheep and pig husbandry. Limitations in their use are outlined.

Oestrogens are considered commercially useful for production of all classes of poultry meat in that they improve quality and sometimes rate of gain, though efficiency of feed conversion may be reduced. The effects with turkeys are not as striking as with chickens. Thiouracil alone is limited in its usefulness; it is more successful in combination with thyroprotein or diethylstilboestrol. For the production of eggs of high quality the use of thyroprotein cannot be justified.

Further investigation is needed before thyroprotein or antithyroid drugs can be recommended for fattening pigs or ruminants. In cattle and sheep stilboestrol increases rate of gain and efficiency of feed utilisation, but may produce undesirable side effects. Sex hormones have not been shown to be of any advantage in fattening pigs.

Oestrogens can be used to induce lactation in cattle, but in view of the troublesome nature of the side effects and the commercially unprofitable yields, their use for the present is not recommended. When thyroprotein is used to increase milk yield extra feed above maximum requirements is essential. Since mortality rate in calves is increased by feeding the dams with thyroprotein, it is probably better for the average commercial dairy farmer not to adopt the practice.

T. D. Bell.

5338

PINO, N. and LEONTI, F. **Aspetti zoeconomici dell'introduzione in coltura e della produttività del Sorgo Sudan Grass in Sicilia.** [The introduction and productivity of Sudan grass sorghum in Sicily, from the viewpoint of animal production.] *Riv. Zootec.*, 1954, **27**, 132-136. [Ist. Zootec. Gen., Fac. Med. Vet., Univ. Camerino.]

The supply of fodder for fattening calves in Sicily during the hot dry summer is a problem which could be solved by the introduction of Sudan grass. At present maize is used to some extent. Three trials are reported, and the results were encouraging. In the first maize and Sudan grass were compared. Both crops were irrigated, and 4 cuts of Sudan grass were possible, giving a greater total yield of green fodder per acre over the season. In the other 2 trials irrigated and unirrigated Sudan grass were compared. Only 2 cuts of the latter were possible, and the season's yield was low, but the results were not discouraging, since under the conditions no other fodder

could be grown. A comparison is made between the feeding value of Sudan grass and maize, and the former is superior. The importance and advantages of Sudan grass are discussed.

T. D. Bell.

5339

RIVERA-BRENES, L. **Technical and economic aspects of roughage production in Puerto Rico.** *Puerto Rico Agric. Exp. Stat. Tech. Paper* No. 12, September 1953, pp. 117.

The 3 grasses mainly used in Puerto Rico are Merker (*Pennisetum purpureum*), Guinea (*Panicum maximum*) and Pará (*Panicum purpurascens*). These are described. They are best used as silage, and literature on silage is reviewed.

Trials with silages from the 3 grasses, each cut at 40-, 90- and 120-day intervals and ensiled immediately or after wilting for 3, 6 and 24 hr. in the field, are reported. Losses of total digestible nutrients, protein, ash and carotene during wilting and ensiling are discussed. The effect of cutting intervals and species on the lignin content and the proportion of leaf to stem are described.

The shortest cutting interval was most economical and best from the nutrition aspect. Ensiling did not cause an uneconomic loss of nutrients, and the maximum use of arable land, scarce in Puerto Rico, could be made. The hope is expressed that the experiences reported will be used to advantage by Puerto Rican livestock producers.—T. D. Bell.

5340

SPRAGUE, M. A. **The effect of grazing management on forage and grain production from rye, wheat and oats.** *Agronom. J.*, 1954, **46**, 29-33. [New Jersey Agric. Exp. Stat., Rutgers Univ., New Brunswick.]

5341

CHAPLINE, W. R., RENNER, F. G., DAVIS, J. B., MYERS, W. M., CLARK, R. T., ELLIS, N. R. and ANDERSON, W. J. Utilización racional de los pastos naturales. [Rational use of natural pastures.] *Proc. IV Conf. Interamericana Agric.*, 1950, 118-125. [U.S. Dept. Agric.]

5342

JOHNSTONE-WALLACE, D. B. **Animal behaviour and grazing management.** *J. Roy. Agric. Soc. Engl.*, 1953, **114**, 11-20. [Royal Agric. Coll., Cirencester.]

5343

of and but IRS, W. T., WAGNER, R. E., HODGSON, R. E., VILLIS, N. R., CHAPLINE, W. R., AYERS, T. L., STALLINGS, J. H. and ANDERSON, W. J. La utilización racional de las plantas forrajeras.

[Rational use of forage plants.] *Proc. IV Conf. Interamericana Agric.*, 1950, 284-291. [U.S. Dept. Agric.]

5344

SQUIBB, R. L., DÍAZ, F., FUENTES, A., GUZMÁN, M. and SCRIMSHAW, N. S. Relación de los forrajes con los problemas de la nutrición en los trópicos americanos. [Relation of forages to the nutrition problems of the American tropics.] *Bol. Ofic. sanit. panamer.*, 1953, Suppl. 1, 110-118. [Inst. Agropecuario Nac., Guatemala.]

5345

NYE, P. H. **A survey of the value to the food-farming areas of the Gold Coast. 2. The granitic soils of the far north.** *Empire J. Exp. Agric.*, 1953, **21**, 262-274.

For part 1 of this series see Abst. 1649, Vol. 24. Studies were made of the effect of 60 or 120 lb. ammonium sulphate and superphosphate per acre on yields of early and late millets (*Pennisetum* spp.), guinea corn (*Sorghum* sp.) and groundnuts.

An application of 120 lb. superphosphate per acre increased the yield of groundnuts by 61 per cent. and that of cereals by about 52 per cent. Cereal yield increased by 29 per cent. with 120 lb. ammonium sulphate per acre. Applications of 60 lb. per acre of each fertiliser gave about two-thirds of the increase in yield obtained with 120 lb.

It is considered that the productivity of this region could be doubled by the proper use of inorganic and organic manures.—P. C. Jowsey.

5346

NYE, P. H. **A survey of the value of fertilizers to the food-farming areas of the Gold Coast. 3. The Voltaian sandstone region and the southern maize areas.** *Empire J. Exp. Agric.*, 1954, **22**, 42-54.

5347

GORDON, J. G., TRIBE, D. E. and GRAHAM, T. C. **The feeding behaviour of phosphorus-deficient cattle and sheep.** *Brit. J. Animal Behaviour*, 1954, **2**, 72-74. [Rowett Res. Inst., Bucksburn, Aberdeenshire.]

Ninety P-deficient cattle and 500 deficient sheep were offered a choice between 2 mineral supplements, one consisting of calcium carbonate only and the other of calcium carbonate plus dicalcium phosphate. They failed to show a significant preference for the P supplement and failed to remedy their deficiency by eating a sufficient quantity.

The selection of P-containing materials by animals with depraved appetites is thought to be

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due to chance, conditioning by experience of well-being after previous bone-eating, or imitation of the behaviour of other animals which have learned to select.—P. C. Jowsey.

5348

COOPER, M. M. **Fodder beet.** *J. Roy. Agric. Soc. Engl.*, 1953, **114**, 27-34. [Wye Coll., Kent.]
See also Absts. 4186, 4191, 4194, 4236, 4524.

HORSES

5349

DOBRYNIN, V. P. **[Milk production in horse breeding.]** *Konevodstvo*, 1953, No. 3, 33.

5350

BARBABANSHCHIKOV, N. and KARSNITSKAYA, M. **[The problem of milk production in horse breeding.]** *Konevodstvo*, 1953, No. 3, 35.

CATTLE

GROWTH AND FATTENING

5351

DAVIS, L. R., AUTREY, K. M., HERLICH, H. and HAWKINS, G. E. (Jr.) **Outdoor individual portable pens compared with conventional housing for raising dairy calves.** *J. Dairy Sci.*, 1954, **37**, 562-570. [Dept. Dairy Husb., Alabama Polytech. Inst., Auburn.]

During each of 2 successive winter periods groups of 8 newborn Jersey and cross Jersey calves were housed in individual stalls inside a barn. Similar groups were housed outside in portable pens. In the first winter the pens were sited on uncontaminated land; during the second winter the site was slightly contaminated by older cattle. During the second year half of the calves on each system of management were inoculated with rumen fluid. All the calves received the same ration.

Calves outdoor made greater weight gains and were less affected by parasitic worms and scours. Indoor calves were subject to respiratory troubles. Inoculation with rumen fluid had no significant effect on growth. The superior growth rate of the outdoor calves was maintained during the summer grazing season.—J. N. Aitken.

5352

KIDWELL, J. F. **Growth relations in range cattle.** *J. Animal Sci.*, 1953, **12**, 895-896. *Proc.* [Univ. Nevada.]

5353

ALEXANDER, G. I. **Rearing dairy calves.** *Austral. Vet. J.*, 1954, **30**, 68-77. [Dept. Agric. Stock, Queensland.]

Calves fed by nipple did not gain more rapidly than those that were bucket-fed. The nipple-fed group took longer to consume their milk than the others, and there was less ear-sucking among them. There was not sufficient scouring in either group to determine whether nipple feeding would reduce this disorder.

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Calves were successfully reared on 15 gal. whole milk and weaned at 4 weeks old provided they were encouraged to eat a dry starter meal at an early age.

Skimmed milk and a high-protein starter were successfully used to rear calves to 6 weeks of age, after an initial period of 7 to 10 days on colostrum and whole milk. There was no difference between gruel and dry meal feeding. The use of a proprietary penicillin preparation with whole milk, followed by a high-protein calf starter, showed no advantage.—T. D. Bell.

5354

STEIN, J. F., KNOTT, C. B. and ROSS, E. B. **Use of special processed soybean flour and whey solubles in milk replacement formulas for dairy calves.** *J. Dairy Sci.*, 1954, **37**, 373-379. [Dept. Dairy Husb., Pennsylvania Agric. Exp. Stat., State College.]

The growth rates of calves given different replacement formulae were compared. It was found that soya bean flour could replace dried whey, distiller's dried maize solubles, bloodmeal and up to a maximum of 43 per cent. of the non-fat dry milk solids given in the milk replacements. Giving soya bean flour at the expense of all the non-fat dry milk solids resulted in retarded growth. The addition of 10 per cent. dextrose, or 8 per cent. lactose and 2 per cent. dextrose, to diets high in soya bean flour did not improve growth rates. Calves on replacements containing whey solubles responded better than calves on replacements containing dried whey. Supplementation of the diets with 0.05 and 0.25 per cent. DL-methionine did not improve growth rates.—J. N. Aitken.

5355

STEIN, J. F., KNOTT, C. B. and ROSS, E. B. **Use of a special processed soybean flour in milk replacements for young dairy calves.** *J. Animal Sci.*, 1953, **12**, 932-933. *Proc.* [Pennsylvania Agric. Exp. Stat.]

5356

HOPPER, J. H., GARDNER, K. E. and JOHNSON, B. C. **Butyrated lard in the ad libitum feeding of "filled milk" for veal production.** *J. Dairy Sci.*, 1954, **37**, 431-435. [Div. Animal Nutrit., Univ. Illinois, Urbana.]

The bodyweight gains of 12 calves given a "filled milk" made by mixing emulsified butyrated lard with fluid skimmed milk and reconstituted dried non-fat milk solids were compared with those of 22 calves given a similar "filled milk" made with emulsified lard. Bull calves of the 5 main dairy breeds were used. Half of the calves in each group received 3 mg. aureomycin hydrochloride per lb. milk.

Calves given the butyrated lard made gains equal to those of calves on whole milk (see Title 2391, Vol. 23) and greater than those of calves on lard-filled milk. There was no significant difference between calves given aureomycin and the controls.—J. N. Aitken.

5357

ROLLINS, W. C. and GUILBERT, H. R. **Factors affecting the growth of beef calves during the suckling period.** *J. Animal Sci.*, 1954, **13**, 517-527. [Univ. California, Davis.]

Statistical analysis of growth data for 159 calves showed that calves from dams in the age range 7 to 10 years were heavier at weaning and grew faster to 4 months of age than calves from younger cows. Calves from heifers and second calves had a higher growth rate from 4 to 8 months. This was thought to be due to the greater persistency of lactation in younger cows. It was concluded that the lactating ability of the beef cow had a direct effect on the growth rate of the calf throughout the entire suckling period.

In a selection experiment on 25 cows it was found that the future productivity of the beef cow could be estimated from the growth rate to 4 months of age of the first calf.—J. N. Aitken.

5358

BARTLEY, E. E., ATKESON, F. W., FRYER, H. C. and FOUNTAINE, F. C. **Antibiotics in dairy cattle nutrition. 3. Effects of different levels of aureomycin intake upon the growth and well-being of dairy calves, and the association of differences with changes in environment.** *J. Dairy Sci.*, 1954, **37**, 259-268. [Dept. Dairy Husb., Kansas Agric. Exp. Stat., Manhattan.]

For previous parts see Absts. 5185, 5217, Vol. 13.

Male and female Holstein and Jersey calves were divided at random into 3 groups of 10 animals each. One group was given a basal ration, the other 2 groups received in addition aureomycin,

15 or 45 mg. per 100 lb. bodyweight, from 4 days to 25 weeks of age. All the calves were housed in a barn which had not previously been used for calf rearing. The results were compared with those of a previous experiment in which the calves were given aureomycin at the 15 mg. rate and reared in a barn which had proved unsuitable for calf rearing.

The bodyweight gains of the control calves in the new quarters equalled the gains of the aureomycin-fed calves in the old quarters. The aureomycin-fed calves in the new quarters made significantly greater gains than the controls under the same conditions. Among Jersey calves the 45 mg. level was more effective than the 15 mg. level. The reverse was true of the Holstein calves. Aureomycin-fed calves consumed more hay and utilised their feed more efficiently than the controls. The differences were not statistically significant.

J. N. Aitken.

5359

RUSOFF, L. L., FUSSELL, J. M., HYDE, C. E., CROWN, R. M. and GALL, L. S. **Parenteral administration of aureomycin to young calves with a note on mode of action.** *J. Dairy Sci.*, 1954, **37**, 488-497. [Dairy Dept., Louisiana Agric. Exp. Stat., Baton Rouge.]

5360

HORN, L. H. (Jr.), SNAPP, R. R. and GALL, L. S. **A study of the effects of antibiotics upon the digestion of feed nutrients by yearling steers, with bacteriological data.** *J. Animal Sci.*, 1953, **12**, 921-922. *Proc.* [Univ. Illinois.]

5361

PERRY, T. W., BEESON, W. M. and HORNBACK, E. C. **The effect of aureomycin on the growth, fattening and feed utilization of beef cattle.** *J. Animal Sci.*, 1953, **12**, 927. *Proc.* [Purdue Univ. Agric. Exp. Stat.]

5362

MCCALL, R. and GRAHAM, W. R. (Jr.) **The value of several ammoniated products as feed for beef cattle.** *J. Animal Sci.*, 1953, **12**, 798-805. [Quaker Oats Co.]

A product composed of hydrolysed and ammoniated maize cobs and oat hulls effectively replaced up to 40 per cent. of the protein supplement in a fattening ration for steers. Ammoniated molasses replacing 20 per cent. of the protein supplement was also effective. A combination of these 2 products replacing 40 per cent. of the protein supplement produced higher liveweight gains. Substitution of urea for up to 25 per cent. of the protein supplement reduced the efficiency of feed conversion.—J. N. Aitken.

5363

- BOHMAN, V. R., TRIMBERGER, G. W., LOOSLI, J. K. and TURK, K. L. **The utilization of molasses and urea in the rations of growing dairy cattle.** *J. Dairy Sci.*, 1954, **37**, 284-293. [Dept. Animal Husb., Cornell Univ., Ithaca, N.Y.]

The following rations were compared in trials on 80 dairy heifers: molasses and urea; maize and soya bean oilmeal; molasses and soya bean oilmeal; molasses, maize and urea. All the animals received hay of poor quality in amounts greater than they would consume. Digestion and balance studies were made on 8 Holstein bull calves.

Animals given soya bean oilmeal with maize or molasses made significantly greater gains than those given molasses and urea or molasses, maize and urea. When hay of good quality replaced the poor hay in the molasses-urea ration adequate gains were made. An increase in daily weight gain was obtained when maize was given with urea and molasses. The digestibility studies showed that molasses depressed the digestibility of dry matter, organic matter, ether extract and crude fibre.—J. N. Aitken.

5364

- THOMAS, O. O., CLANTON, D. C. and WILLSON, F. S. **Efficiency of urea utilization as influenced by mineral constituents in a wintering ration for beef steers.** *J. Animal Sci.*, 1953, **12**, 933. *Proc.* [Montana State Coll.]

5365

- PLUMLEE, M. P., TOTUSEK, R. and BEESON, W. M. **The effect of adding trace minerals to rations of identical twin beef cattle.** *J. Animal Sci.*, 1953, **12**, 928. *Proc.* [Purdue Univ.]

5366

- DAVIS, G. K., ARRINGTON, L. R. and OUTLER, J. C. **Availability of phosphorus in defluorinated phosphate fed to cattle after activation in the pile.** *J. Animal Sci.*, 1953, **12**, 913. *Proc.* [Florida Agric. Exp. Stat.]

5367

- JARL, F. Uppfödningsförsök med nötkreatur. 2. [Experiments in rearing dairy cattle. 2.] 1. Olika fet mjölk till S. R. B.-kalvar. [1. Effect of feeding S. R. B. calves on milk of differing fat content.] 2. Syrad skummjolk till laglandskalvar. [2. Effect of feeding Holstein calves on acidified skimmed milk.] *Kgl. Lantbrukshögsk. Statens Husdjursförsök Medd.* No. 51, 1954, pp. 55. English summary. 1. In each experiment there were 3 or 4 groups, representing different levels of fat in milk, each of

8 calves comparable in respect of birthweight, breeding, and age and weight of mother. The milk used was the mixed whole milk of the herd, diluted as required with skimmed milk returned from the creamery. As soon as the calves could eat solid food, they were given hay and concentrates and the amounts eaten were recorded. Up to 7 months, the concentrate mixture was oatmeal 60, wheat bran 10, linseed cake meal 28 and dicalcium phosphate 2 per cent. Although the milk experiment ran only from 5 to 65 days of age in the first 4 experiments and from 5 to 41 days in the fifth, records continued to 1 year of age. Calves were not allowed to graze until they were 4 months old.

The amount of milk given being such as to hold metabolisable energy from milk constant, reduction of the fat content of milk to 2 per cent., vitamins A and D being supplied by cod liver oil at the lowest fat levels, had no evident effect on growth as measured by weight, height at withers and 2 measures of girth, or on health. In the first 4 experiments with relatively high milk allowances, there was no relation of amount of hay or of concentrates eaten to the fat content of milk, but in the fifth, with less milk, consumption of total solid food increased; but within the experiment that of hay fell and of concentrates rose as the fat content of the milk fell from 4 to 2 per cent. At the end of a year there was no significant difference between the calves; what difference in size existed was referable to the sires used.

The experiment in which milk with only 1.5 per cent. fat was tested had to be stopped because that group was in bad condition. The reason was not certain and the test was not repeated.

2. Skimmed milk acidified with 0.1 per cent. acetic acid may be used instead of fresh skimmed milk and is to be preferred in hot weather.

Tables are provided showing quantities of milk of fat content 4.4 to 3.0 per cent. and of skimmed milk to be mixed to give a standard mixture with 2½ per cent. fat, and the amounts recommended from 5 to 180 days of age.—I. Leitch.

5368

- DEANS, R. J., VAN ARSDELL, W. J., REINEKE, E. P. and BRATZLER, L. J. **The effect of progesterone-stilbestrol implants on rate of gain and carcass characteristics of steers.** *J. Animal Sci.*, 1953, **12**, 901. *Proc.* [Michigan State Coll.]

5369

- BURRIS, M. J., BOGART, R. and OLIVER, A. W. **Alteration of daily gain, feed efficiency and carcass characteristics in beef cattle with male hormones.** *J. Animal Sci.*, 1953, **12**, 740-746. A group of 3 female and 3 male calves were given weekly intramuscular injections of 1 mg.

testosterone per kg. bodyweight. A similar group received injections of methyl androstenediol at the same rate. Six of each sex received no treatment and served as controls. The rations were good quality alfalfa hay and a concentrate mixture. All animals were slaughtered at 800 lb. liveweight. Weights of wholesale cuts, rate of gain, and feed consumption were recorded.

Calves of both sexes treated with testosterone made significantly greater daily liveweight gains and utilised their feed more efficiently than the controls. Treatment with methyl androstenediol had no effect on daily gain or feed required per unit gain. Calves treated with testosterone had a lower percentage of loin and a higher percentage of round than the controls. Treated females had a higher percentage of chuck than control females. Methyl androstenediol had no effect on carcass characteristics.—J. N. Aitken.

5370

KLOSTERMAN, E. W., KUNKLE, L. E. and MOXON, A. L. **The influence of sex hormones upon rate and efficiency of gain of fattening calves.** *J. Animal Sci.*, 1953, **12**, 948-949. [Ohio Agric. Exp. Stat.]

5371

DURHAM, R. M. and KNOX, J. H. **Correlations between grades and gains of Hereford cattle at different stages of growth and between grades at different times.** *J. Animal Sci.*, 1953, **12**, 771-774. [Dept. Animal Husb., New Mexico Agric. Exp. Stat.]

Statistical analysis of data from 424 steers graded at weaning and again as yearlings and at slaughter and from 59 cattle fed as post-weaning calves showed that there was no correlation between grade at weaning and carcass grade. There was a low but significant correlation between yearling grade and carcass grade. Bodyweight gains made during a particular period were associated with grades at the end of that period.

J. N. Aitken.

5372

PILLINGER, D. B. and KELLY, J. T. **Beef cattle investigations at Ross.** *Tasmanian J. Agric.*, 1954, **25**, 5-16.

The investigations were made on a farm of 24,000 acres, supporting 11,000 sheep and 400 head of Shorthorn cattle. The farm, the management of the stock and the weather during the investigation are described. The cattle were kept on pasture with supplementary hay, and some silage and turnips during the winter and green forage when pasture was poor. Thirty representative steers were weighed monthly from weaning at 7 months old, when they weighed on

the average 534 lb., till they were slaughtered 12 months later at an average liveweight of 1042 lb. The average daily gain was 1.4 lb., but this varied greatly (0.7 to 2.6) and was closely related to the state of the grazing and the amount of green fodder available. The heavier animals at weaning maintained their advantage, indicating the importance of keeping the calves growing well up to weaning. The average dressing percentage was 57, and carcasses were considered good.

T. D. Bell.

5373

MEYER, J. H., LOFGREEN, G. P. and HART, F. K. **The value of certain supplements for beef cattle fed harvested green alfalfa.** *J. Animal Sci.*, 1953, **12**, 806-811. [Dept. Animal Husb., Univ. California, Davis.]

Crossbred Brahman steers and heifers, 266 animals in all, were used. It was found that green alfalfa cut in the pre-bloom to full-bloom stage and supplemented with a minimum amount of Sudan hay produced 193 and 103 lb. beef per acre during 2 consecutive 30-day periods. Cattle given green alfalfa with free access to Sudan hay produced less beef per acre. Green alfalfa plus 1 lb. barley per 100 lb. bodyweight increased the daily rate of gain. Spraying alfalfa with molasses increased consumption, but daily gain and efficiency of feed conversion decreased.

Methods of calculating total digestible nutrients from requirements for maintenance and body gain and from digestion trial data are compared.

J. N. Aitken.

5374

CLARK, R. and BARRIE, N. **Winter feeding experiments.** *Farming in S. Africa*, 1954, **29**, 135-138. [Div. Vet. Serv., Onderstepoort.]

Afrikaner bullocks, 3 years old, were successfully wintered on good quality veld hay. When supplements of urea and molasses, cowpea hay or silage were given alone or in combination the animals gained from 11 to 148 lb. during the winter. In these tests the molasses and urea were incorporated into a meal of maize cobs. Four lb. of the supplements, supplying 0.6 lb. crude protein, were given. Mola-meal, molasses absorbed into cane fibre, could be used instead of maize cobs.

Another method of giving the urea was to dissolve 10 lb. in 80 lb. molasses with a little water, and feed the mixture in troughs. Young cattle kept on poor quality grass hay during the winter and given 1 lb. of this mixture gained weight while controls lost.

To fatten cattle during the winter was not considered economic, since those which only maintained weight caught up during the subsequent summer with those which had gained during the

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winter. Cattle which were allowed to lose during the winter, however, never caught up, and in addition carcass quality was adversely affected, so that expenditure on supplements to maintain weight was justified.

Sheep getting hay only for their winter feed lost weight, and the quality of the wool was impaired. Supplements of urea and molasses with or without silage reduced loss of weight and almost prevented the decline in wool quality. Cowpea hay supplement also reduced weight losses, but observations on wool quality have not yet been made.

T. D. Bell.

5375

PAWSON, H. C. and BRUCE, R. **Wintering store cattle. Cockle Park trial, 1952-53.** *Agriculture, J. Minist. Agric. Engl.*, 1954, **61**, 134-138. [King's Coll., Newcastle upon Tyne.]

From December 1952 to April 1953, a group of 10 bullocks inwintered on hay, roots, oats and beans made better gains, average 154 lb., than a similar group outwintered on the same ration without roots, average 94 lb. At the end of the winter, however, the latter were valued at £3 per head more than those inwintered. During the following summer the outwintered group gained more, 165 lb., than the inwintered, 137 lb.

A group of heifers inwintered on the same ration of hay, roots, oats and beans gained more, 151 lb., than another inwintered group on grass silage to appetite, 97 lb.—J. S. Thomson.

5376

JARL, F., NORDFELDT, S., HELLEDAY, T. and MÅNSSON, N. C. Uppfödningsförsök med kött djur. [Feeding experiments with beef cattle.] *Kgl. Lantbrukshögsk. Statens Husdjursförsök Särtryck* No. 99, 1953, pp. 15.

In Sweden there is a tendency to shift from dairy farming, since there is a surplus of milk, to beef production or crop farming without livestock. Co-operative experiments in beef production showed that in rate and economy of liveweight gain to about 21 months of age and 425 kg. liveweight Holstein and Aberdeen-Angus × Holstein calves were superior to SRB, purebred Aberdeen-Angus and crosses between these breeds. The economic inferiority of the Aberdeen-Angus was the result of allowing the calves to suckle and including the cow's feed in the cost of production.

Killing-out percentage varied little. Aberdeen-Angus, purebred and crosses, had more fat in the carcass but did not command a higher price.

Bullocks grew and fattened more rapidly than heifers. Those wintered in an insulated barn did better during the winter than those provided with open shelter, but the difference disappeared in the next pasture season.—I. Leitch.

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5377

HARRIS, W. A. and COTTON, R. H. **A study in varying cottonseed cake levels in a beet-belt steer-fattening ration.** *J. Animal Sci.*, 1954, **13**, 483-489. [Holly Sugar Corp., Colorado Springs.]

Cottonseed cake, 1.5, 1.0, 0.5 lb., was used to supplement a typical beet-belt ration of ground maize 6, molasses 3, alfalfa hay 4.5 to 5 and pressed beet pulp or wet beet pulp 60 lb. With the lower levels of cottonseed cake, compensating increments were made in the amount of maize in ration. Comparable groups of 10 to 20 yearling Hereford steers were used. Rations containing higher amounts of cottonseed cake and correspondingly more protein did not improve dressing percentage, grade, or market value and resulted in slower and more expensive gains. When no cottonseed cake was given market value and dressing percentage were reduced. The best results were obtained with 0.5 lb. cottonseed cake.

J. N. Aitken.

5378

YAO, T. S., DAWSON, W. M. and COOK, A. C. **Relationships between meat production characters and body measurements in beef and milking Shorthorn steers.** *J. Animal Sci.*, 1953, **12**, 775-786. [U.S. Dept. Agric.]

Correlation coefficients between age, growth and beef characters and body measurements were calculated from data for 101 Beef Shorthorn and 62 Dairy Shorthorn steers. High birthweight was associated with shorter times to reach weaning and final weights, but tended to produce poorer slaughter and carcass grades and dressing percentage. There was a high positive correlation between average daily gain and efficiency of feed utilisation. Slaughter grade, carcass grade and dressing percentage were correlated with one another and these in turn were positively correlated with width and circumference measurements. Height measurements were correlated with one another, as were length measurements; both were negatively correlated with beef characters.

Birthweight had positive correlations with height and length measurements but negative correlations with width measurements. Formulae for calculating indices for beef characters are given.

J. N. Aitken.

4379

McCORMICK, J. A. and KIDWELL, J. F. **Producing beef from Holstein steers.** *Nevada Agric. Exp. Stat. Circular* No. 3, October 1953, pp. 15.

Nineteen Holstein steer calves were reared on a calf-feeding system to 23 weeks of age, when they weighed about 400 lb. They were then given hay and pasture only, until they were slaughtered at 2 years old, and about 1200 lb. Over the whole

fattening period average daily gain was 1.83 lb., and hay consumed per lb. liveweight increase was 11.3 lb. The management, which fitted into the normal dairy farm practice with little extra cost of labour or equipment, is described. At slaughter the carcasses graded well. The heavier carcasses were better than the lighter in dressing percentage and composition.—T. D. Bell.

5380

VAN ARSDELL, W. J., HOEFER, J. A., BRANAMAN, G. A. and LUECKE, R. W. **Supplementing corn silage for fattening steers.** *J. Animal Sci.*, 1953, **12**, 934. *Proc.* [Michigan State Coll.]

5381

ITTNER, N. R., LOFGREEN, G. P. and MEYER, J. H. **A study of pasturing and soiling alfalfa with beef steers.** *J. Animal Sci.*, 1953, **12**, 939-940. *Proc.* [Univ. California.]

5382

BAKER, A. L. and BLACK, W. H. **Crossbred types of beef cattle for the Gulf Coast region.** *U.S. Dept. Agric. Circular* No. 844, May 1950, pp. 23.

5383

O'MARY, C. C., WARREN, E. P., DAVIS, T. J. and PIERCE, H. H. **The effects of stillbestrol on the performance of fattening steers fed blackstrap molasses.** *J. Animal Sci.*, 1953, **12**, 952-953. *Proc.* [Univ. Georgia.]

See also Absts. 4343, 4345, 4383, 4401, 4490.

MILK PRODUCTION

5384

FRENCH, M. H. **The development of feeding standards for cattle.** *E. African Agric. J.*, 1954, **19**, 179-187.

5385

DONKER, J. D., KOSHI, J. H. and PETERSEN, W. E. **The influence of oxytocin-induced udder evacuation on milk and butterfat production in a complete lactation.** *J. Dairy Sci.*, 1954, **37**, 299-305. [Div. Dairy Husb., Univ. Minnesota, St. Paul.]

A set of identical twin cows was used. In the second lactation 1 member was used as a control while oxytocin was injected into the other in amounts ranging from 30 to 1.5 I.U. after each regular milking. During the first 10 weeks of the third lactation the twins were reversed as control and experimental animals. Residual milk was collected after each injection.

Administration of oxytocin resulted in increased yields of milk and butterfat.—J. N. Aitken.

5386

POIJÄRVI, I. Beiträge zur Wirkung der Dauer der Melkpause auf die Intensität der Milchsekretion des Kuheuters. [Effect of the length of interval between milkings on the intensity of milk secretion in the cow's udder.] *Maataloust. Aikakausk.*, 1954, **26**, 50-59. [Landwirt. Versuchsanst., Tikkurila.] Finnish summary.

In 2 experiments with 12 cows in groups of 6, made at 2 periods in lactation, the night milking interval of 12 hr. was extended by 5 or 8 min. daily to 13, 14 or 15 hr. and then gradually reduced to 12 or 13 hr. During 20 days at each time interval the milk yield a.m. and p.m. was recorded. These gradual changes in the length of the interval between milkings had no effect on the average total daily yield for any one group at a given stage in lactation. The average milk yield at the evening milking expressed as a percentage of the 24-hr. yield agreed with that calculated on the basis of the interval between morning and evening milking on the assumption that milk secretion was uniform during the 24-hr. period.—W. Godden.

5387

POIJÄRVI, I. Kokeita lypsyjen väliajan pituuden vaikutuksesta lehmien maidontuotantoon lypsettäessä kaksi kertaa päivässä. [Effect of the length of interval between milkings on milk yield of cows milked twice daily.] *Valt. Maataloust. Tiedonantoja*, 1953, No. 234, pp. 11. German summary.

See preceding Abst.

5388

ASKER, A. A., RAGAB, M. T. and KAMAL, T. H. **The effect of feeding thyroprotein on the composition of milk of Egyptian buffaloes.** *Indian J. Dairy Sci.*, 1954, **7**, 36-39. [Dept. Animal Breeding, Fac. Agric., Cairo Univ., Giza.]

A group of 4 buffaloes received thyroprotein at the rate of 15 g. daily for 18 weeks. A similar group was used as control. During the experimental period the treated group were given 3 lb. extra grain mixture per head. Statistical analysis of the results showed that there was no significant difference between the 2 groups in the percentages of protein, total solids, solids-not-fat, butterfat and chlorine in the milk.—J. N. Aitken.

5389

OLOUFA, M. M. **Effect of feeding thyroprotein on milk production, butterfat percentage and body weight of Egyptian buffaloes.** *J. Animal Sci.*, 1953, **12**, 952. *Proc.* [Fouad Univ.]

5390

LOGAN, V. S. **The effect on milk production of legume silage harvested in the bud stage vs.**

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full bloom stage of maturity of alfalfa. *J. Dairy Sci.*, 1954, **37**, 247-251. [Animal Husb. Div., Central Exp. Farm, Ottawa.]

The fat-corrected milk yield of cows fed on silage made from alfalfa at the bud stage was significantly higher than that of cows fed on alfalfa silage cut at the full-bloom stage.

Varying the amounts of digestible protein in the meal supplements given with each type of silage had little effect on milk yield. Total digestible nutrient intake and fat-corrected milk yield were closely correlated.—J. N. Aitken.

5391

WARREN, F. S., JOHNSON, R. E., DEMBICZAK, C. M., EATON, H. D., BEALL, G. and MOORE, L. A. Lactation response to artificially-dehydrated and pelleted alfalfa added to a ration of timothy-grass mixed hay and grain. *J. Dairy Sci.*, 1954, **37**, 523-530. [Dept. Animal Indust., Storrs Agric. Exp. Stat., Conn.]

Holstein and Guernsey cows were divided into 6 balanced groups of 4 animals each. All animals were given a basal ration consisting of timothy hay to appetite and grain. Treatment consisted in supplementing the basal ration with levels of 0.5, 1.0 and 1.5 lb. artificially dehydrated and pelleted alfalfa per 100 lb. liveweight daily. The animals within each group were assigned to control and the 3 treatments.

At all levels of supplementation the amount of timothy hay eaten decreased and of grain, dry matter, total digestible nutrients and net energy increased. Average daily milk and fat-corrected milk production increased when alfalfa was given. The greatest response was obtained with the highest levels.

The carotenoid concentration of the milk increased almost directly with each added level of the pelleted alfalfa. Liveweight also increased. The efficiency of feed utilisation, in terms of lb. total digestible nutrients and lb. net energy required to produce 1 lb. fat-corrected milk, was reduced. The vitamin A concentration of the milk did not increase with the level of alfalfa as rapidly in Holsteins as it did in Guernseys.

J. N. Aitken.

5392

BAILEY, G. L., BROSTER, W. H., BROWN, B. B. and FOOT, A. S. The relative feeding value for milk production of two National Cattle Foods. *J. Dairy Res.*, 1954, **21**, 1-4. [Nat. Inst. Res. Dairying, Univ. Reading.]

The economic use of artificially dried forage crops in cattle rations is hindered by variations in their feeding value. The difficulty for the farmer may be overcome if they are previously compounded with cereals into cattle cubes of standard

feeding value. An experiment is described which compared the values of milk production of such cubes (National Cattle Food No. 6) with cubes deriving most of their protein content from imported oilseed residues (National Cattle Food No. 1).

Tests were made in mixed herds of cows with their first calves, with daily yield of from 2 to 4 gal., in 1951-52 and 1952-53. Diets containing hay, N.C.F. 1, and N.C.F. 6, in varying proportions, were allocated at random to the individual cows. The results were evaluated in each year by analysing the relation between milk yield and diet, liveweight being also taken into account. The cattle foods were found to have closely similar values, the slight difference in favour of N.C.F. 1 not being significant.

Practical advantages for the design of the experiment, particularly for dealing with very heterogeneous experimental material, are claimed.

I. McDonald.

5393

HUFFMAN, C. F., DEXTER, S. T. and DUNCAN, C. W. The feeding value of pea and oat silage for dairy cows. *Quart. Bull. Michigan Agric. Exp. Stat.*, 1954, **36**, 298-304.

Oat and pea silage had the following percentage composition (as percentage dry matter in brackets): dry matter 29.0, protein 4.54 (15.7), ether extract 1.23 (4.24), crude fibre 8.3 (28.5), N-free extract 12.2 (42.1); total digestible nutrients were 58.4 per cent. of dry matter and there were 42.8 (147) p.p.m. carotene. The pH was 4. Digestibility coefficients were: dry matter 62.5, protein 68.2, ether extract 58.3, crude fibre 64.0 and N-free extract 63.2.

In 18 reversal trials this silage was used to replace concentrates or hay in the ration of dairy cows. In 3 trials 36 lb. replaced 6 lb. maize and 3 lb. soya bean meal; in 5, 20 to 25 lb. replaced 6 lb. maize; in one, 41 lb. replaced 14.7 lb. hay; in 3, 75 to 85 lb. replaced all the concentrates and hay, and in 6 all or part of the hay was replaced by silage to appetite, without concentrates. In all the trials the replacements maintained satisfactory milk production.—T. D. Bell.

5394

GRASHUIS, J. and VAN KOETSVELD, E. E. Geënsileerde- versus gedroogde suikerbietenpulp. Een voederproef met melkkoeien. [Ensiled versus dried sugar beet pulp. Feeding test with milk cows.] *Inst. Moderne Veevoeding "De Schothorst"*, Hoogland, pp. 19.

The test was with 16 cows fed on 3 kg. hay, 3 kg. dried grass, 3 kg., (or 2 for heifers,) dried pulp, straw and concentrates according to weight and

milk yield, for a pre-period of 27 days. Then for 42 days half of them continued on the dried pulp and half had the same pulp ensiled, in equivalent amount in terms of dry matter. There was a post-period of about a month. There was no measurable difference in performance between the groups. The butterfat of the silage group had a higher Reichert Meissl number; iodine number was low, by Netherlands standards, in both groups, slightly lower in the silage group.—I. Leitch.

5395

MCCULLOUGH, M. E. **Factors involved in forage quality for dairy cows.** *Georgia Agric. Exp. Stat. Tech. Bull.* No. 3, July 1953, pp. 25.

This is a review article in which the literature relating to the following aspects is critically considered: the rumen and its ability to convert simple nitrogenous compounds and cellulose into usable forms of protein and energy; the relative balance between nutrients and its importance; the attributes which measure the ability of a forage to promote milk production.—W. Godden.

5396

FERRARI, E. Foraggi e mangimi dannosi alla qualità del latte ed alla lavorazione casearia. [**Forages and feedingstuffs harmful to the quality of milk and dairy produce.**] *Riv. Zootec.* 1954, 27, 141–143.

Some feeds which have a bad effect on milk, butter and cheese are discussed. Lupin seeds, soya bean, sesame, groundnut, rape, walnut and sunflower cakes and meals should be used with discretion, and the same applies to beet pulp and beet molasses. Tomato seed meal, fishmeal and silkworm chrysalises should never be given to dairy cows. The effect of different types of silage on the cheesemaking quality of milk is discussed. The type of silage has little or no effect on the quality of the milk destined for direct consumption.

T. D. Bell.

5397

MATHER, R. E., BROCKETT, J. E. (Jr) and POULTON, B. R. **The value of molasses for increasing the intake of hay and total nutrients by dairy cattle.** *J. Animal Sci.*, 1953, 12, 924. *Proc.* [New Jersey Agric. Exp. Stat.]

5398

KOOIJMAN, I. P. Enige proeven met magnesiumpraeparaten (bitterzout, kieseriet, dolokalsupra en magnesiumoxyd) als bijvoeder voor runderen. [**Tests with magnesium preparations, Epsom salt, kieserite, calcium magnesium carbonate and magnesium oxide, as supplement for cattle.**] *Maandbl. Landbouw-*

voord., 1952, 9, 429–431. [Labs. Physiol. Dieren, Landbouwhogsk., Wageningen.]

In tests with 2 cows it was established that both would take kieserite (27 per cent. MgO), calcium magnesium carbonate (19 per cent. MgO, 30 per cent. CaO) and MgO in amounts giving the equivalent of 10 mg. Mg daily, in as little as 0.25 kg. meal. Only one would take Epsom salt. *In vitro*, the salts were soluble to the extent of 93 per cent. or more in dilute HCl at pH 2.3. The salts may be made into nuts with meal.

Legally, calcium magnesium carbonate may not be used in mineral mixtures for horses or ruminants, but kieserite is allowed. It is better to add it to mineral mixtures on the farm. The cost of kieserite and calcium magnesium carbonate is 3 per cent., or less, of that of MgO. The double carbonate should be used where rations require addition of Ca.—I. Leitch.

5399

La pulpa de café como alimento para ganado. [**Coffee pulp as a cattle feed.**] *Proc. IV Conf. Interamericana Agric., Trav. Tec.*, 1950, 245–255. [Inst. Interamer. Cien. Agric. Turrialba, Costa Rica.]

5400

HARKER, K. W., TAYLOR, J. I. and ROLLINSON, D. H. L. **Studies on the habits of Zebu cattle. 1. Preliminary observations on grazing habits.** *J. Agric. Sci.*, 1954, 44, 193–198. [Animal Health Res. Centre, Entebbe, Uganda.]

Observations made over a 72-hr. period showed that Zebu cattle, during each 24-hr. period, spent 7.7 hr. grazing and 5.2 hr. ruminating. Most of the grazing was during daylight, but 77 per cent. of the time spent ruminating was during the hours of darkness.—J. N. Aitken.

5401

ASHTON, E. D. **Milk recording and the use of milk records in dairy stock improvement in England and Wales.** *Empire J. Exp. Agric.*, 1954, 22, 1–9. [Bur. Records, Milk Marketing Board.] A review of progress during the last 40 years.

5402

BARRIOLA, J. P. El mejoramiento del ganado lechero en el Uruguay. [**Improvement of dairy herds in Uruguay.**] *Proc. IV Conf. Interamericana Agric.*, 1950, 41–56.

5403

HEERMAN, H. A., GRAHAM, G. W. and BOWER, K. W. **The effect of tannins in Korean lespedeza and other feeds on milk production.** *Missouri*

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Agric. Exp. Stat. Res. Bull. No. 532, September 1953, pp. 8.

The average tannin content of Korean lespedeza on a dry matter basis fell from 8.94 per cent. in September to 2.89 per cent. about a month later. The seeds contained about 10 per cent. in October. In comparison, alfalfa hay was found to contain 10 per cent. tannins, silage 22.9, dry beet pulp 15.0 and hedge apple, known to reduce milk yield in cows, 26 per cent.

A ration containing about 12 per cent. tannins to which a further addition of 5 per cent. tannic acid was made had no effect on growth, feed consumption or milk yield of cows and there was no digestive disturbance. Tannic acid is apparently converted to tannates in the mouth and upper part of the digestive tract and these are further broken down to non-astringent gallic and pyrogalllic acid.—J. S. Thomson.

See also Absts. 4342, 4344, 4347, 4870.

REPRODUCTION

5404

ROBERTSON, A. and RENDEL, J. M. **The performance of heifers got by artificial insemination.** *J. Agric. Sci.*, 1954, **44**, 184-192. [Inst. Animal Genetics, Edinburgh.]

The object of this investigation was to determine whether the bulls put at the disposal of farmers through artificial insemination centres produced progeny superior to that produced by the type of bull which the farmers would otherwise have used. Statistical analysis of the records of 1400 artificially inseminated heifers with those of contemporary

naturally inseminated heifers showed that there was no significant difference in milk yield. The milk of the former had a higher butterfat content. J. N. Aitken.

5405

RAGAB, M. T., ASKER, A. A. and GHAZY, M. S. **Effect of season of calving, dry period and calving interval on milk yield and lactation period of Egyptian buffaloes.** *Indian J. Dairy Sci.*, 1954, **7**, 8-18. [Dept. Animal Breeding, Fac. Agric., Univ. Cairo, Giza.]

A statistical analysis of 929 lactations of 345 buffaloes showed that those calving in the autumn and winter had slightly higher milk yields and longer lactations than those calving in spring and summer. Length of dry period decreased with advancing age.

The highest yields were obtained from animals whose dry period did not exceed 60 to 90 days. There was a significant positive correlation between calving interval and milk yield.—J. N. Aitken.

5406

DAVIS, H. P. **Relationships between age at first calving, productive life, and fat production at first lactation.** *J. Animal Sci.*, 1953, **12**, 893. *Proc.* [Univ. Nebraska.]

5407

ALIM, K. A. and AHMED, I. A. **Month of calving, age at first calving, and calving intervals of the buffaloes in a dairy herd in Egypt.** *Empire J. Exp. Agric.*, 1954, **22**, 37-41. [Dept. Animal Prod., Fac. Agric., Univ. Alexandria.]

SHEEP

5408

RUF, E. W., HALE, W. H. and BURROUGHS, W. **Observations upon an unidentified factor in feedstuffs stimulatory to cellulose digestion in the rumen and improved liveweight gains in lambs.** *J. Animal Sci.*, 1953, **12**, 731-739. [Iowa Agric. Exp. Stat., Ames.]

Soya bean oilmeal, linseed oil, wheat bran, distiller's dark grains, maize and yeast added singly to rumen fermentation flasks stimulated cellulose digestion. Animal by-products, vitamins and casein hydrolysate plus purine bases had no stimulating effect. Evidence suggested that certain roughages, like grain and certain other concentrate feeds, contain an unidentified substance helpful in cellulose digestion in rumen fermentation. Yeast and manure extract were rich sources of the substance, which was found to be heat-stable and soluble in water and ethanol of low concentration. The material appeared to be organic, not a mineral and not a B complex vitamin or a protein. Feed

consumption and liveweight gains of lambs on a semi-purified diet were increased when the substance was added to the diet in the form of yeast. J. C. Gill.

5409

BIELIŃSKI, K. and CHOMYSZYN, M. **Próba określenia wielkości i wytrwałości laktacji u merynoprokosów.** [Tests to determine the volume and duration of lactation in merino sheep.] *Rocz. Nauk rol. [B]*, 1953, **66**, No. 4, 55-68. [Inst. Zootech.] English and Russian summaries.

The milk yields from lambing of 4 merino ewes, hand milked from lambing, and from weaning after 90 days of 7, were measured. For the first group the average length of lactation was 193 days, and the average total yield was 53.7 kg. milk with 8.4 per cent. fat. The second group gave 44.2 kg. milk of 8.5 per cent. fat during 152 milking days. The higher daily yield and longer lactation of the second group was attributed to

the effect of suckling. Milking had no effect on wool production or quality. It is suggested that merino sheep could be exploited for milk production.

T. D. Bell.

5410

TRETYAKOV, N. N. Rentgenologicheskoe issledovanie skeleta novorozhdennykh yagnat s razlichnym urovnem pitaniya. [**X-ray studies of the skeleton of newborn lambs on different feeding levels.**] *Dokl. Akad. Nauk S.S.S.R.*, 1953, 93, 741-744. [Inst. Morf. Zhivot. Im.A.N. Severtsov., Akad. Nauk SSSR.]

Lambs born of ewes on (1) a normal diet, and (2) a normal diet plus 400 g. concentrates were killed and studied anatomically. X-ray examination showed that single lambs from group 1 ewes were much better developed than twin lambs of the same group, and lambs from group 2 ewes better than lambs from group 1 ewes. Twins from group 2 ewes approximated in their development to single lambs from group 1 ewes.—W. Hughes.

5411

GUYER, P. Q. and DYER, A. J. The effect of feeding concentrates to ewes during late pregnancy on milk yield of ewes and birth weight and growth of lambs. *J. Animal Sci.*, 1953, 12, 917-918. *Proc.* [Univ. Missouri.]

5412

WHITING, F., SLEN, S. B., BEZEAU, L. M. and CLARK, R. D. The sulfur requirements of mature range ewes. *J. Animal Sci.*, 1953, 12, 936. *Proc.* [Lethbridge Exp. Stat.]

5413

BUSH, L. F. A study of protein levels for fattening feeder lambs. *J. Animal Sci.*, 1953, 12, 910. *Proc.* [Cornell Univ.]

5414

JORDAN, R. M. Thyroprotein for lactating ewes and its effect on lamb weights. *J. Animal Sci.*, 1954, 13, 438-442. [Dept. Animal Husb., S. Dakota Agric. Exp. Stat.]

In 3 trials of 7 to 8 weeks each, thyroprotein was given to lactating ewes at levels of $\frac{1}{2}$, 1 and 2 g. per ewe daily. Treated ewes tended to lose more bodyweight than controls but the daily gain, feed intake and efficiency of feed conversion of their lambs were similar to those of lambs of untreated ewes.—J. C. Gill.

5415

GERRING, J. C. Flushing of ewes in fat lamb production. *N.Z. J. Agric.*, 1954, 88, 25-27. [Dept. Agric., Ruakura Animal Res. Stat.]

In each of 2 successive seasons 150 Romney ewes were flushed for 6 weeks before tupping and 150

were grazed over a similar period so that body-weight was just maintained. A second trial, again over 2 years with 300 ewes, is also described. They were divided into 4 groups of 75 ewes each. One group was flushed for 3 weeks before tupping, one for 2 weeks, and one for 1 week; in the fourth flushing was begun when the rams were turned in. Results showed that, for maximum twinning, flushing should be begun at least 3 weeks before the start of the breeding season, and should continue until 5 weeks after the first ewes were mated. Flushed ewes were not found to breed earlier and were slightly more difficult to get in lamb. A net gain of 20 per cent. in lambs alive at 28 days can be obtained by better management of the ewes without extra cost.—J. C. Gill.

5416

GUNNARSSON, P. Fóðrunartilraunir með síldarmjölsgjöf handa sauðfé. [**Feeding experiments with herring meal for sheep.**] *Rit Landbúnaðardeildar, A-Flokkur*, No. 7, 1953, pp. 40. [Reykjavík.]

Experiments were made at 2 centres in the winter 1946-1947, at one of these again in 1947-1948 and at another centre in each of the winters 1947 to 1951. In the first experiments there were 5 groups each of 2 ewes, one control and the others given 50, 100, 200 or 300 g. herring meal daily. Later there were 2 groups only, with from 20 to 50 ewes in each. The supplements were given from February or March to some time in May and weights were recorded in the following autumn. Quantities of herring meal compared were 100 and 300 g., 75 and 150 g., 100 and 150 g.

The herring meal was given with such hay as was to be had, from cultivated or from uncultivated pasture or a mixture. It was readily eaten, and even in the largest amount did no harm. There were more twins with the higher allowances. On the average the lambs, especially twins and ewe lambs, grew better in the group given more herring meal. The difference in weight between groups of ewes when the experiment ceased in autumn was in favour of the greater supplement or such as could be referred to the incidence of twinning.

The recommendation is to give 30 to 60 g. herring meal daily to ewes in winter, increasing the allowance to 75 to 100 g. in late winter if much fodder is given: if fodder is scarce it is better, though more costly, to give a cereal supplement.—I. Leitch.

5417

ROSS, C. V., GARRIGUS, U. S., HAMILTON, T. S. and EARLEY, E. B. Comparing high-, medium-high-, and low-protein corn for fattening lambs. *J. Animal Sci.*, 1954, 13, 433-437. [Dept. Animal Sci., Coll. Agric., Univ. Illinois.]

N.A. and R., October 1954

Thirty lambs were used in a 70-day trial in which lambs given high- and medium-high-protein maize, 13.2 per cent. and 11.03 per cent. crude protein, respectively, made significantly greater gains and produced significantly more wool than those given low-protein maize, 7.72 per cent. crude protein. All lambs were on equal feed, the level of which was determined by the lambs on low-protein maize. J. C. Gill.

5418

BLAKESLEE, L. H., HENNEMAN, H. A. and NELSON, R. H. **Hay crop silage and hay alone or in combination with corn silage or hay silage for pregnant ewes during gestation.** *J. Animal Sci.*, 1953, 12, 938. *Proc.* [Michigan State Coll.]

5419

SCHNEIDER, B. H., LUCE, L. C. and GOODWIN, E. E. **Pea supplements, pelleting, self-feeding, and pea vine silage in lamb fattening.** *J. Animal Sci.*, 1953, 12, 930-931. *Proc.* [State Coll. Washington.]

5420

BELL, M. C., CHAMBERLAIN, C. C., HOBBS, C. S., KEMP, H., MORGAN, W. H. and JOHNSON, P. **The feeding value and digestibility of wood molasses in rations for lambs and steers.** *J. Animal Sci.*, 1953, 12, 907-908. *Proc.* [Univ. Tennessee.]

5421

JORDAN, R. M. and WEAKLEY, H. **Cobalt salt in lamb rations.** *S. Dakota Agric. Exp. Stat. Bull.* No. 425, March 1953, pp. 8.

Two trials with 60 and 56 Western feeder lambs are described, in which no consistent difference in liveweight gain or feed efficiency occurred, between 4 groups, full-fed and allowed free choice of salt alone or containing $\frac{1}{2}$, 1 and $1\frac{1}{2}$ oz. cobalt chloride per 100 lb. In 3 further trials, in successive years, at another station, 1 oz. cobalt chloride per 100 lb. salt added to a prairie hay, barley and soya bean oil meal ration led to an increase of 0.05 lb. in average daily gain per lamb. Co added to an alfalfa, barley and soya bean oilmeal ration significantly increased the daily gain in 2 of the trials but had the opposite effect in a third. In the final year both prairie and alfalfa hay contained 0.10 p.p.m. Co, 0.03 p.p.m. over the minimum required. J. C. Gill.

5422

MEYER, J. H., WEIR, W. C. and SMITH, J. D. **The influence of high sodium chloride intakes on gain, efficiency of feed utilization, nitrogen balance and feed digestibility.** *J. Animal Sci.*, 1953, 12, 924-925. *Proc.* [Univ. California.] Experiments with lambs.

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5423

MEYER, J. H. and WEIR, W. C. **The tolerance of sheep to high intakes of sodium chloride.** *J. Animal Sci.*, 1954, 13, 443-449. [Dept. Animal Husb., Univ. California, Davis.]

Rations with sodium chloride added at levels of 0.5, 4.8, 9.1 and 13.1 per cent. were given to 4 groups of 10 ewes. No significant difference between the groups was found during the growing and fattening period of 71 days. The weight gains of groups were similar during the 154 days of the breeding and gestation periods but during the first 28 days of lactation the ewes receiving 13.1 per cent. NaCl showed a highly significant loss of weight compared with the other 3 groups. Weight gains of lambs were similar in all groups. Analysis of blood and milk constituents showed only serum chloride and milk chloride increased by high NaCl intakes.—J. C. Gill.

5424

JORDAN, R. M. and BELL, T. D. **Effect of aureomycin on suckling lambs.** *J. Animal Sci.*, 1954, 13, 450-454. [S. Dakota Agric. Exp. Stat., State Coll., College Station.]

In a 42-day trial in which suckling lambs were drenched daily with aureomycin and in 2 of 3 trials in which an aureomycin supplement was given to suckling lambs for 33 to 50 days the daily gains of the treated lambs were slightly higher and the feed consumption per 100 lb. gain slightly lower than in controls. The differences were not significant. In 3 further trials implantation of 80 mg. aureomycin into day-old or week-old lambs had no significant effect on rate of gain. J. C. Gill.

5425

BRIDGES, J. H., MILLER, J. C., KAMMLADE, W. G. (Jr.) and KUNKEL, H. O. **Effects of various levels of aureomycin in fattening lambs.** *J. Animal Sci.*, 1953, 12, 660-665. [Dept. Biochem., Texas Agric. and Mech. Coll. System, College Station.]

In all, 154 fattening lambs were used in 3 trials over periods of 84 to 112 days. The lambs were hand-fed on rations of milo and alfalfa hay, with and without cottonseed meal. Addition of aureomycin to these rations at rates of 1.1 to 15 mg. per lb. feed resulted in relatively small increases in rate of gain. In all trials aureomycin at 2.2 to 5 mg. per lb. feed increased feed efficiency, but not at 1.25 mg. or 15.0 mg. per lb. feed.—J. C. Gill.

5426

BRIDGES, J. H., MILLER, J. C., KAMMLADE, W. S. (Jr.) and KUNKEL, H. O. **Effects of feeding various levels of aureomycin to fattening lambs.** *J. Animal Sci.*, 1953, 12, 908-909. *Proc.* [Texas Agric. Exp. Stat.]

5427

- HATFIELD, E. E. and GARRIGUS, U. S. **Antibiotics in rations for lambs.** *J. Animal Sci.*, 1953, **12**, 919-920. *Proc.* [Univ. Illinois.]

5428

- ELLIOTT, R. F. and ELLSWORTH, S. A. **The effect of aureomycin and type of ration on fattening lambs.** *J. Animal Sci.*, 1953, **12**, 914. *Proc.* [Lederle Labs.]

5429

- TILLMAN, A. D. and MACVICAR, R. W. **The effect of aureomycin upon growth, digestion of ration constituents, rectal temperatures and urine volume of sheep.** *J. Animal Sci.*, 1953, **12**, 955-956. *Proc.* [Oklahoma Agric. Exp. Stat.]

5430

- BELL, T. D., SMITH, W. H. and ERHART, A. B. **The effect of stilbestrol upon lamb performance in feedlot.** *J. Animal Sci.*, 1954, **13**, 425-432. [Dept. Animal Husb., Kansas State Coll., Manhattan.]

Feeder lambs, 517 in all, were used in a feeding trial of 112 days. Half the lambs received a subcutaneous implant in the jaw of 15 mg. stilboestrol at the outset and half of these received a second implant after 70 days. There was no significant difference in liveweight gain between the groups receiving one and two implants; both of them made significantly greater gains than untreated lambs. Carcase grades and dressing percentages were slightly lower in treated lambs. Twelve died from prolapse of the rectum or from excessive swelling in the rectal and perineal region; all had received 2 implants. Nearly all implanted lambs had preputial swelling and showed distress during urination. Measurements of the urogenital system showed enlarged accessory reproductive organs in the treated lambs.—J. C. Gill.

5431

- JORDAN, R. M. **Effect of stilbestrol on suckling and fattening lambs.** *J. Animal Sci.*, 1953, **12**, 670-679. [S. Dakota Agric. Exp. Stat.]

Twelve 2- to 2½-month-old lambs, implanted in the jaw with 12 mg. stilboestrol and fed over a 71-day period, made the same average daily gains as untreated lambs. Twenty-five 3½- to 4-month old lambs with similar implants gained 0.437 lb. compared with a gain of 0.409 lb. per lamb daily for the controls. The difference was not significant. In the second trial, especially, the treated lambs showed increased mammary development and temporary retardation of testis growth. Milk could be expelled from all treated ewe lambs and most of the treated ram lambs. In a further trial of 91 days with 54 feeder lambs similar implants

increased rate of gain and feed efficiency significantly. Carcase yield was 47.6 per cent. compared with 48.8 per cent. for controls, and the grade was lower. Shrinkage after slaughter was greater in the treated lambs, but cooking losses were similar to those of the controls. N concentration in the urine was similar in the 2 groups but the treated lambs excreted less urine and their N retention was 30 per cent. greater. In field studies without controls 2000 out of 9000 lambs with 12 mg. stilboestrol implants died from urinary calculi and prolapse. After sale further heavy losses due to prolapse occurred amongst the remainder. A 10 per cent. mortality is reported in 3500 other lambs similarly treated.—J. C. Gill.

5432

- JORDAN, R. M. **Effect of level of stilbestrol on growth and fattening of lambs.** *J. Animal Sci.*, 1953, **12**, 680-683. [S. Dakota Agric. Exp. Stat.]

In the first experiment a group of 25 Western lambs averaging 70 lb. were implanted in the jaw with 6 mg. stilboestrol. They were full-fed for 81 days with a control group. Treated lambs gained 0.48 lb. and controls 0.35 lb. daily, the difference being highly significant. Feed consumption was similar and treated lambs required per 100 lb. gain 72 per cent. of the grain and 75 per cent. of the hay required by the controls. In the second trial groups of 36 lambs were used and a third group implanted with 12 mg. stilboestrol was added. Daily rate of gain was very significantly less in the controls than in the treated groups, which differed little. Treated lambs required 70 per cent. of the grain and 53 per cent. of the hay, per 100 lb. gain, required by the controls. Carcase yields and grades did not differ between treated groups but in both trials were lower than for controls. No undesirable effect of treatment appeared during the trial.—J. C. Gill.

5433

- JORDAN, R. M. **Effect of stilbestrol, stilbestrol-progesterone implants on fattening lambs.** *J. Animal Sci.*, 1953, **12**, 948. *Proc.* [S. Dakota State Coll.]

5434

- STORY, C. D., CHENG, E. W., HALE, W. H. and BURROUGHS, W. **Growth and fattening responses in lambs fed natural estrogenic substances from soybean oil meal and certain pasture and hay crops.** *J. Animal Sci.*, 1953, **12**, 940-941. *Proc.* [Iowa State Coll.]

5435

- MULLICK, D. N., MURTY, V. N. and KEHAR, N. D. **Effect of stilbestrol and thiouracil on the**

utilisation of nutrients in sheep. *J. Animal Sci.*, 1953, **12**, 950-951. *Proc.* [Indian Vet. Res. Inst.]

5436

HALE, W. H., STORY, C. D., CULBERTSON, C. C. and BURROUGHS, W. **The value of low levels of stilbestrol in the rations of fattening lambs.** *J. Animal Sci.*, 1953, **12**, 918. *Proc.* [Iowa State Coll.]

5437

HENNEMAN, H. A., RUST, R. and MEITES, J. **Stimulation of growth and fattening in lambs with progesterone-estrogen combinations.** *J. Animal Sci.*, 1953, **12**, 947. *Proc.* [Michigan State Coll.]

5438

JORDAN, R. M. **Effect of surfactants and bentonite on fattening lambs.** *J. Animal Sci.*, 1953, **12**, 922. *Proc.* [S. Dakota State Coll.]

5439

BUCK, L. L., GARRIGUS, U. S., FORBES, R. M. and HALE, W. H. **Effects of arsenical supplements on growing-fattening lambs.** *J. Animal Sci.*, 1953, **12**, 909-910. *Proc.* [Univ. Illinois.]

5440

JORDAN, R. M. **Urea for pregnant ewes.** *S. Dakota Agric. Exp. Stat. Bull.* No. 429, May 1953, pp. 8.

Three wintering trials with pregnant ewes are described. Ewes receiving protein supplements containing 5 and 10 per cent. urea did as well as ewes receiving soya bean meal in respect of total gain, fleece weight, lambing and weaning percentage, birthweight and 55-day weight of lambs. The urea had no ill effect and was palatable. Ewes receiving 1 part soya bean to 3 parts alfalfa and urea did better than those receiving urea with soya bean and alfalfa or wheat middlings in equal amounts. This was most marked when urea was given at the 10 per cent. level.—J. C. Gill.

5441

ALBERT, W. W., GARRIGUS, U. S., FORBES, R. M. and HALE, W. H. **Modified urea supplements with corn silage for wintering ewe lambs.** *J. Animal Sci.*, 1953, **12**, 905. *Proc.* [Univ. Illinois.]

5442

HUTCHINGS, S. S. and STEWART, G. **Increasing forage yields and sheep production on intermountain winter ranges.** *U.S. Dept. Agric. Circular* No. 925, September 1953, pp. 63.

A 13-year study of intermountain winter ranges

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in respect of the utilisation of forage species by sheep, the influence of precipitation on herbage production and plant density and the effects of grazing intensity on forage yields and on sheep and wool production, is reported. The ranges are characterised by low precipitation and scant vegetation. Palatability controlled forage utilisation. Relative abundance, stage of maturity and weather conditions affected the kind of forage eaten. Herbage production was directly correlated with the rainfall during the previous 12 months. Each additional inch of precipitation increased herbage by about 46 lb. per acre. Increases in total herbage production over the trial were 54, 46 and 34 per cent. for light, moderate and heavy grazing, respectively. At the moderate grazing level mortality was less and ewes were 4 to 18 lb. heavier and produced 1 lb. more wool and 11 per cent. more lambs than those on the heavily grazed range. Income was \$3.46 per ewe on moderate grazing and \$1.69 per ewe on heavy grazing. The study indicates that it is advantageous to rotate grazing from year to year, to leave the range early to avoid grazing during the late winter, and to provide water for sheep each day.—J. C. Gill.

5443

RAGAB, M. T., ASKER, A. A. and KADI, M. R. **Genetic factors affecting weights of Ossimi lambs.** *Empire J. Exp. Agric.*, 1953, **21**, 304-308. [Animal Breeding Dept., Fac. Agric. Giza, Egypt.]

After adjustment of data for sex, type of birth, age of dam and inbreeding of lambs, the heritabilities of birthweight, weaning weight and slaughter weight of Ossimi lambs were found to be 34, 10 and 29 per cent., respectively.—T. D. Bell.

5444

SLLEN, S. B., PETERS, H. F. and MYHR, P. I. **The relationship of clean fleece weight to body weight in range sheep.** *Canad. J. Agric. Sci.*, 1954, **34**, 198-202. [Div. Animal Husb., Exp. Farms Serv., Canad. Dept. Agric., Ottawa.]

The relation between clean fleece weight and bodyweight was analysed to find out whether bodyweight would be a useful criterion for selecting breeding stock with a view to increased wool production. Over 3000 sheep of 5 breeds were examined. The methods of sampling and of statistical analysis are described. The data show that, in general, these measures are highly correlated. It is concluded that despite this high correlation, bodyweight accounts for so little of the variation in clean fleece weight that other fleece and body characteristics should be investigated in order to develop a selection index.—A. W. Boyne.

5445

ENGLAND, G. J. **Observations on the grazing behaviour of different breeds of sheep at Pantyrhuad Farm, Carmarthenshire.** *Brit. J. Animal Behaviour*, 1954, **2**, 56-60. [Dept. Animal Health, Univ. Coll. Wales, Aberystwyth.]

The grazing behaviour of 4 ewes of different breeds, Blackface, Clun, Spanish and Suffolk, each nursing a single lamb, was recorded during two 24-hr. periods.

The results are presented in detail.

P. C. Jowsey.

5446

HUNTER, R. F. **Some notes on the behaviour of hill sheep.** *Brit. J. Animal Behaviour*, 1954, **2**, 75-78. [Edinburgh and East of Scotland Coll. Agric.]

5447

BARRIOLA, J. P. **Evolucion de la ganaderia ovina uruguaya. [Evolution of sheep farming in Uruguay.]** *Proc. IV Conf. Interamericana Agric.*, 1950, 27-40.

See also Absts. 4343, 4345, 4709, 4753, 5611.

PIGS

5448

LUTHER, H. G., REYNOLDS, W., PENDERGRASS, G., APPEL, P. P. and MCGINNIS, J. **Studies in baby pig nutrition.** *J. Animal Sci.*, 1953, **12**, 923-924. *Proc.*

5449

REYNOLDS, W. M., PENDERGRASS, G., APPEL, P. P., LUTHER, H. G. and MCGINNIS, J. **Unidentified growth factors for swine.** *J. Animal Sci.*, 1953, **12**, 929. *Proc.*

5450

GARD, D. I., TERRILL, S. W. and BECKER, D. E. **Response of the pig to sources of unidentified factors.** *J. Animal Sci.*, 1953, **12**, 916. *Proc.* [Univ. Illinois.]

5451

TRIBBLE, L. F. and HOGAN, A. G. **A contribution to the search for unrecognized nutrients.** *J. Animal Sci.*, 1953, **12**, 934. *Proc.* [Univ. Missouri.]
Experiments with pigs.

5452

CRAMPTON, E. W. and NESS, O. M. **A meal mixture suitable as the entire ration to be self-fed dry to pigs weaned at ten days of age.** *J. Animal Sci.*, 1954, **13**, 357-364. [Fac. Agric., Macdonald Coll., McGill Univ., Que.]

Twenty-four litters of pigs were used in 3 replicates of a $2 \times 2 \times 2$ factorial experiment. The piglets were weaned at 10 days old and from then to the normal weaning age of 8 weeks they were given only dry meal diets fed to appetite. The main comparisons studied were terramycin or penicillin supplements, 26 or 30 per cent. protein in the diet and 3 or 8 per cent. fat in the diet.

The penicillin supplement was better than the terramycin, for it gave 14 per cent. higher feed intakes, 18 per cent. faster growth rates and, to a

less degree, better feed conversion efficiencies. Pigs given 30 per cent. protein in the diet grew 28 per cent. faster, ate 12 per cent. more food, and had a 15 per cent. advantage in feed conversion efficiency over those given 26 per cent. protein. The addition of 5 per cent. maize oil to the ration had no effect on feed intake, but growth rate was improved and feed conversion efficiency increased by 18 per cent. The performance of the pigs during the experiment was equal to that usually attained by sow-nursed pigs of comparable breeding.—I. A. M. Lucas.

5453

CRAMPTON, E. W. **A meal mixture suitable as the entire ration to be self-fed dry to pigs weaned at ten days of age.** *J. Animal Sci.*, 1953, **12**, 912. *Proc.* [Macdonald Coll.]

5454

CRANE, F. M. **A study of diets (dry) designed for weaning the baby pig at an early age (10 pounds or less).** *J. Animal Sci.*, 1953, **12**, 912. *Proc.* [Land O'Lakes Creameries.]

5455

BECKER, D. E., ULLREY, D. E. and TERRILL, S. W. **Protein and amino acid intakes for optimum growth rate in the young pig.** *J. Animal Sci.*, 1954, **13**, 346-356. [Univ. Illinois, Urbana.]

During 3 trials in one experiment piglets were fed from 3 or 7 to 28 days of age on liquid milk diets containing from 10.2 to 30.6 per cent. protein from dried skimmed milk. The rate and efficiency of growth rose with protein level up to from 22 to 24 per cent. Higher protein levels were of no additional benefit. Whether the pigs were allowed equal amounts of feed, or fed to appetite, did not affect this conclusion.

During 3 trials in a second experiment pigs were fed from 35 to 63 days of age on diets containing from 10.0 to 25.5 per cent. protein, again from dried

skimmed milk. In 2 trials the feed was given twice daily as a slop with water; in the third dry. Equalised feeding was used. Levels of milk protein above 12 per cent. in the diet gave no increase in rate or efficiency of growth. The performance of the pigs in both experiments was satisfactory.

From the results estimates were made of amino-acid levels in the diet to support maximum growth of pigs from 1 to 9 weeks of age.—I. A. M. Lucas.

5456

SCHILLER, K. Über den Ergänzungswert von Eisweissträgern verschiedener Herkunft in der tierischen Ernährung. [Supplementary values of protein feeds of different origin in animal nutrition.] *Arch. Tierernährung*, 1953, 3, 342-359. [Inst. Tierernährung, Forschungsanst. Landwirtsch., Völkenrode, Brunswick.]

In a series of N balance studies and some feeding experiments, nearly all with rats, the biological values of the protein in 3 German varieties of soya beans, one sample of commercial extracted soya bean meal, 3 varieties of lupin seeds and 2 samples of fishmeal were compared. In nearly all the experiments the total protein in the ration was 12 per cent.

There was no marked difference in the biological values of the protein in the 3 lots of soya beans or the commercial meal, but the true digestibility of the protein in the latter was much higher, owing probably to the presence in the beans of some substance inhibiting trypsin. The 3 varieties of lupin seeds showed differences in both biological value and digestibility of their protein, owing probably to the presence of some inhibiting substance, particularly in the yellow lupin seeds, which gave the lowest values and had the most bitter taste. Trials were made with rats, 37 and 87 days old, but no difference due to age was noticed. Steaming one sample of soya beans caused an increase in the biological value of the protein to well above the value for fishmeal protein. Similar but less marked increases occurred with 2 varieties of lupin seeds. These results were confirmed by weight gains in feeding trials with rats. In N balance studies with both rats and young pigs no complementary effect was found between the proteins of the extracted soya bean meal and those of cod meal. Similarly in rats there was no effect between the proteins of lupin seeds and those of cod meal.

It is customary in Germany in feeding pigs to start with a ration containing about 20 per cent. mixed protein from barley, potatoes, soya bean meal and fishmeal and to reduce this gradually to 12 per cent. by the end of the feeding period. N balance studies with rats at 31 and 46 days of age showed that at both ages such a protein mixture at either the 20 or the 12 per cent. level gave a

higher biological value than that from a ration of starch, soya bean meal and fishmeal. At both ages the mixed protein at the 12 per cent. level had a higher digestibility and biological value than at the 20 per cent. level. This suggests that an economy might be effected in the level of protein for young pigs.—W. Godden.

5457

BEESON, W. M., JACKSON, H. D. and MERTZ, E. T. Quantitative threonine requirement of the weanling pig. *J. Animal Sci.*, 1953, 12, 870-875. [Dept. Animal Husb., Purdue Univ. Agric. Exp. Stat.]

Five groups of 3 weanling pigs each were fed on a ration consisting of 88 per cent. maize, 6 per cent. essential amino-acids, without threonine, and 4 per cent. minerals along with vitamins and cerelose. The basal ration of one group contained 0.2 per cent. L-threonine and to it was added 0.4, 0.6, 0.8 or 1.0 per cent. DL-threonine, which gave L-threonine contents of 0.4, 0.5, 0.6, and 0.7 per cent. The experiment lasted 35 days and the highest liveweight gain and the lowest feed consumption per lb. of liveweight gain were attained when the ration contained 0.4 per cent. L-threonine, equivalent to 3 per cent. of the crude protein.

W. Godden.

5458

CATRON, D. V., ACKER, D. C., ASHTON, G. C., MADDOCK, H. M. and SPEER, V. C. Lysine and/or methionine supplementation of corn-soybean oil meal rations for pigs in drylot. *J. Animal Sci.*, 1953, 12, 910. *Proc.* [Iowa State Coll.]

5459

PFANDER, W. H. and TRIBBLE, L. F. The effect of supplementing practical rations for weanling pigs with lysine and methionine. *J. Animal Sci.*, 1953, 12, 927. *Proc.* [Univ. Missouri.]

5460

POND, W., HILLIER, J. C. and MACVICAR, R. W. Amino acid supplementation to corn and milo rations for growing pigs. *J. Animal Sci.*, 1953, 12, 928. *Proc.* [Oklahoma Agric. and Mech. Coll.]

5461

HALE, R. W. Restriction in the feeding of bacon pigs as a means of securing economy of meal conversion. *Res. Exp. Rec. Minist. Agric. N. Ireland*, 1952, 28-32. [Minist. Agric. N. Ireland.]

In 3 similar trials pigs were fed on meal from about 60 lb. liveweight to slaughter weight of about 200 lb. on high or low planes of nutrition, and on each plane the feed was given twice or

thrice daily. On the high plane the pigs received 4 lb. meal at 90 lb. liveweight, increasing to 7½ lb. at 175 lb. liveweight; the low-plane pigs started with 4 lb. meal at 90 lb. liveweight, but increased only to a maximum of 5½ lb. at 180 lb. liveweight. Rates of liveweight increase and feed consumption were recorded for the first 16 weeks of the trials.

Economy of feed conversion was better and rate of liveweight increase greater in the pigs on the high plane, which were fed almost to appetite, than in those on the low plane. On neither plane was there a difference in performance due to the number of daily feeds. The results confirmed previous findings at the same institute (Hillsborough). No explanation is offered for the difference from the general experience that restricted feeding gives more efficient utilisation of feed.

T. D. Bell.

5462

CRAMPTON, E. W., ASHTON, G. C. and LLOYD, L. E. **The effect of restricting feed intake of market hogs during the finishing period on the quality of the bacon carcass.** *J. Animal Sci.*, 1954, **13**, 321-326. [Fac. Agric., Macdonald Coll., McGill Univ., Que.]

Groups of weanling pigs, 25 to 40 lb. liveweight, were fed during the winter or summer to bacon weight of 200 lb. All were fed to appetite up to 110 lb. liveweight. During this period the meal had 16 per cent. protein and the average consumption was 4½ to 5 lb. daily. From 110 to 200 lb. liveweight the protein was reduced to 13 per cent. Half the pigs continued to be fed to appetite, averaging 8.3 lb. meal daily in the winter-fed group and 7.3 lb. in the summer-fed. The other half were restricted to 6.3 lb. meal daily. At slaughter in the winter-fed group on full feed 58 and on restricted feed 70 per cent. gave grade A carcasses with less fat in proportion to lean. The restricted group gained 0.45 lb. less daily and took 17 days longer to reach bacon weight. In the summer-fed group the difference in daily gain between the full and restricted groups was only 0.24 lb. There were only 34 and 38 per cent. grade A carcasses in the full and restricted groups, respectively. Efficiency of feed conversion was the same on full or restricted feeding, 5 lb. feed per lb. liveweight increase in the winter- and 4.2 lb. in the summer-fed groups.—T. D. Bell.

5463

HANSON, L. E., FERRIN, E. F. and AUNAN, W. J. **The effect of limited feeding on growth and reproduction of gilts.** *J. Animal Sci.*, 1953, **12**, 919. *Proc.* [Univ. Minnesota.]

5464

SELF, H. L., GRUMMER, R. H. and CASIDA, L. E. **The effects of various sequences of full and**

limited feeding on the reproductive phenomena in Chester White and Poland China gilts. *J. Animal Sci.*, 1953, **12**, 954. *Proc.* [Univ. Wisconsin.]

5465

MERKEL, R. A., BRAY, R. W., GRUMMER, R. H., PHILLIPS, P. H. and BOHSTEDT, G. **The influence of limited-feeding, by the use of high fiber rations, upon growth, fattening and carcass characteristics of swine.** *J. Animal Sci.*, 1953, **12**, 903. *Proc.* [Univ. Wisconsin.]

5466

AXELSSON, J. and ERIKSSON, S. **The optimum crude fiber level in rations of growing pigs.** *J. Animal Sci.*, 1953, **12**, 881-891. [Inst. Animal Nutrit., Royal Agric. Coll., Sweden.]

Four experiments are reported, each with 16 pigs of initial weight about 20 kg. The rations used were well balanced, except for fibre, and the pigs were fed to appetite. In each experiment there was a preliminary period, until the pigs reached 30 kg., on a ration containing 6.6 per cent. fibre. They were then divided into 4 comparable groups of 4 pigs, all receiving the same ration except that varying amounts of wheat straw were substituted for grains to give fibre contents of 4.8, 6.3, 7.8 and 9.3 per cent. Each trial was divided into 3 weight periods, 30 to 50 kg., 50 to 70 kg. and 70 to 100 kg., the amount of digestible protein in the ration decreasing from the preliminary period to period 3. Metabolisable energy of the rations was estimated from digestion trials and decreased with increase in fibre content.

Statistical analysis of the data showed that 6.57 per cent. fibre in the ration was optimum for gain in weight and 7.26 per cent. for efficiency of feed conversion. The economical optimum, taking feed cost into account, was 6.64 per cent. fibre. Over the whole period, on the average 11.03 megacalories were consumed per kg. weight gain. Average dressing percentage of the carcasses varied between 72.7 and 73.5 and was independent of the amount of fibre in the ration. There appeared to be a slight tendency for carcasses to decrease in fatness as the fibre content of the ration increased.

J. S. Thomson.

5467

WISE, M. B., BARRICK, E. R., WISE, G. H. and OSBORNE, J. C. **Effects of substituting xylose for glucose in a purified diet for pigs.** *J. Animal Sci.*, 1954, **13**, 365-374. [N. Carolina Agric. Exp. Stat., Raleigh.]

Three groups each containing four 2-week-old pigs were fed on a synthetic diet containing 30 per cent. casein, 37.4 per cent. sugar, 26.6 per cent. lard and 6.0 per cent. minerals. For the first

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group the sugar was all glucose, for the second a 50:50 mixture of glucose and xylose and for the third all xylose. After a transition period of 7 days, the test period lasted 38 days, with weekly weighings. Group 1 grew normally but the introduction of xylose into the diet reduced the average weekly gain per pig from 3.48 lb. in group 1 to 1.34 in group 2 and 0.76 in group 3. The average weekly food consumptions were 4.89, 3.54 and 2.94 lb. The voluntary activity of pigs in groups 2 and 3 was reduced and their coats became rough and dry. Pigs in group 1 were normal throughout the test.

In a second experiment with 5 pairs of pigs of similar age the ration was altered by increasing the sugar content to 56 per cent. glucose for one pig and 56 per cent. xylose for the other in each pair. The lard was reduced to 8 per cent. The experiment lasted 5 weeks after a transition period and in the second week the N balance and sugar output in the urine were estimated daily. Feed consumption was the same in both groups, but the average weekly gains were 1.63 lb. with glucose and 0.95 lb. with xylose. The N retentions were 19.54 and 7.38 g. weekly and the sugar recovered in the urine 0.64 and 49.72 per cent. of the intake, respectively. Cataracts formed in the pigs receiving xylose.—W. Godden.

5468

WISE, M. B., BARRICK, E. R., WISE, G. H. and OSBORNE, J. C. **Effects of substituting xylose for glucose in a purified diet for pigs.** *J. Animal Sci.*, 1953, **12**, 936. *Proc.* [N. Carolina State Coll.]

5469

DAY, B. N., ANDERSON, G. C., JOHNSON, V. K. and LEWIS, W. L. **The effect of a high fat ration on swine gains and carcass quality.** *J. Animal Sci.*, 1953, **12**, 944-945. *Proc.* [W. Virginia Univ.]

5470

BARRICK, E. R., BLUMER, T. N., BROWN, W. L., SMITH, F. H., TOVE, S. B., LUCAS, H. L. and STEWART, H. A. **The effects of feeding several kinds of fat on feed lot performance and carcass characteristics of swine.** *J. Animal Sci.*, 1953, **12**, 899. *Proc.* [N. Carolina State Coll.]

5471

KROFF, D. H., PEARSON, A. M. and WALLACE, H. D. **Waste beef fat in swine rations with special reference to its effect on carcass characteristics.** *J. Animal Sci.*, 1953, **12**, 902. *Proc.* [Florida Agric. Exp. Stat.]

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5472

HOPE, K. M., WESTON, V. E. and GARSTONE, P. **Whale by-products for pig feeding.** *J. Agric. W. Austral.*, 1954, **3**, 231-233. [Denmark Res. Stat.]

In a series of experiments it was found that whalemeat and whale solubles could be successfully given to pigs as sole supplement to a ration of crushed wheat. Whalemeat was equivalent to meatmeal but whale solubles were slightly inferior. Whale solubles were less satisfactory than meatmeal as a supplement to dried brewer's grains. After 100 lb. liveweight whale solubles could completely replace meatmeal as protein supplement. Carcase quality in all experiments was good.

J. S. Thomson.

5473

SENIOR, B. J. and SHEEHY, E. J. **The effect of fineness of grinding on the feeding value of barley for pigs.** *J. Dept. Agric., Republic of Ireland*, 1952-53, **49**, 93-98. [Dept. Animal Nutrit., University Coll., Dublin.]

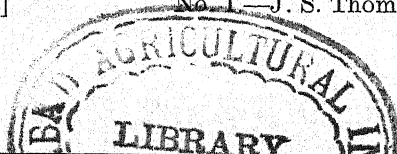
Three comparable groups of pigs were fed from a week after weaning to slaughter weight on a mixed meal ration containing barley. The barley for group 1 was fine-ground to pass a 1/16-in. screen, and had the consistency of flour. For group 2 it was ground to pass through a 3/16-in. screen, and for group 3 it was only crushed. The percentage of barley was increased gradually from 20 to 45 lb. liveweight to 60 at 110 lb. liveweight. The meal was given as a thick slop. Apart from the difference in fineness, all groups were treated in exactly the same way. The rate of gain, efficiency of feed conversion and final weight of group 3 were significantly less than those of groups 1 and 2, which were the same. It was concluded that coarse grinding was economically desirable, but the added expense of fine grinding was not justifiable.—T. D. Bell.

5474

BOHMAN, V. R., KIDWELL, J. F. and McCORMICK, J. A. **High levels of alfalfa in the rations of growing-fattening swine.** *J. Animal Sci.*, 1953, **12**, 876-880. [Dept. Animal Husb., Nevada Agric. Exp. Stat.]

Four trials with a total of 102 pigs are recorded on the feeding of ground alfalfa at levels up to 60 per cent. of the ration of barley or wheat, or a mixture of these grains, with a protein supplement to appetite. Good growth and feed utilisation were obtained with up to 30 per cent. alfalfa; larger amounts depressed growth rate. No advantage was found in giving terramycin with a ration containing 20 per cent. alfalfa. Carcase quality in all groups receiving up to 50 per cent. alfalfa was graded medium, with a few choice No. 1.—J. S. Thomson.

35*



5475

SINGLETARY, C. B., WATTS, A. B., CROWN, R. M. and DAMON, R. A. (Jr.) **Cottonseed meal in practical rations for growing and fattening swine.** *J. Animal Sci.*, 1953, **12**, 932. *Proc.* [Louisiana Agric. Exp. Stat.]

5476

HEADY, E. O., WOODWORTH, R., CATRON, D. and ASHTON, G. C. **New methods in determining substitution ratios for corn and soybean oil-meal in swine rations.** *J. Animal Sci.*, 1953, **12**, 920. *Proc.* [Iowa State Coll.]

5477

TERRILL, S. W., BECKER, D. E., EDWARDS, R. M. and NESHEIM, M. C. **Ladino clover pasture and grass-legume silage for bred gilts and sows.** *J. Animal Sci.*, 1953, **12**, 941-942. *Proc.* [Univ. Illinois.]

5478

THOMAS, O. O. and FLOWER, A. E. **Value of pelleted rations for swine.** *J. Animal Sci.*, 1953, **12**, 933. *Proc.* [Montana State Coll.]

5479

MUHRER, M. E., GARNER, G. B. and PFANDER, W. H. **Improving a swine ration containing roughage and urea by fermenting with rumen micro-organisms.** *J. Animal Sci.*, 1953, **12**, 926. *Proc.* [Univ. Missouri.]

5480

LEWIS, C. J., CATRON, D. V., COMBS, G. E. and ASHTON, G. C. **Cane sugar in pig starters.** *J. Animal Sci.*, 1953, **12**, 923. *Proc.* [Iowa State Coll.]

5481

CAMERON, C. D. T. **Seaweed meal in the ration for bacon hogs.** *Canad. J. Agric. Sci.*, 1954, **34**, 181-186. [Exp. Farm, Nappan, Nova Scotia.]

From the results of a trial made with 72 pigs it was shown that the inclusion of 2, 4 or 6 per cent. seaweed (*Ascophyllum nodosum*) in a balanced ration did not affect weight gain or carcass quality. The balanced ration was of barley, tankage or fishmeal and minerals, and was given to appetite. The pigs were fed from a weaning weight of 40 lb. to slaughter weight of 200 lb., the percentage protein in the ration being reduced at 100 lb. liveweight. The results also indicated, incidentally, that 9 per cent. fishmeal, reduced to 5 per cent. at 100 lb. liveweight, gave a better growth rate than 16 per cent. tankage, reduced to 8 per cent.

T. D. Bell.

5482

GOBBLE, J. L. and MILLER, R. C. **Soft phosphate with colloidal clay in rations for growing and fattening swine.** *J. Animal Sci.*, 1953, **12**, 916-917. *Proc.* [Pennsylvania State Coll.]

5483

CARPENTER, L. E. and LARSON, N. **Antibiotics and the reproduction of swine.** *J. Animal Sci.*, 1953, **12**, 812-818. [Hormel Inst., Austin, Minn.]

Gilts received a ration with or without 2 g. aureomycin per 100 lb. feed until they reached 180 to 200 lb. liveweight; the aureomycin was then reduced to 1 g. per 100 lb. feed and continued for one or two complete gestation and lactation cycles. The suckling pigs had access to rolled oats with 1.8 g. aureomycin per 100 lb. The aureomycin had no significant effect on reproductive performance.

Sows received aureomycin or penicillin by mouth or injection shortly before parturition, and the concentration of antibiotic was estimated in the blood of the sows and of the piglets within a few hours after birth. Neither antibiotic was detected in the blood of the piglets.

Aureomycin given in the diet at 1 g. per 100 lb. was not consistently detectable in the milk, and even after larger amounts were given in capsules the concentration in the milk was small and variable. No difference was seen in the growth of young pigs until they began to eat solid food, when those whose mothers received antibiotic in the feed had access to this as well as to the creep feed.—D. Duncan.

5484

ELAM, J. F., JACOBS, R. L., FOWLER, J., HALE, F. and COUCH, J. R. **Effect of feeding chloromycetin mycelial meal upon the growth and fecal microflora of swine.** *J. Animal Sci.*, 1953, **12**, 819-823. [Dept. Biochem. Nutrit., Texas Agric. Exp. Stat., College Station.]

Five groups of 8 weanling Duroc pigs received for 13 weeks an all-vegetable basal ration alone or supplemented with 0.96 mg. vitamin B₁₂ per 100 lb., or 0.5 per cent. chloromycetin mycelial meal, or vitamin B₁₂ plus 10.4 per cent. meat scraps, or vitamin B₁₂ plus meat scraps plus the mycelial meal.

Neither vitamin B₁₂ nor chloromycetin mycelial meal increased weight gain or feed efficiency. Meat scraps increased the number of faecal clostridia, but chloromycetin reduced the increase and at the same time increased the yeast count and the chloromycetin-resistant organisms.

D. Duncan.

5485

BURNSIDE, J. E., GRUMMER, R. H., PHILLIPS, P. H. and BOHSTEDT, G. **The effect of intermittent**

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administration of aureomycin to growing-fattening swine. *J. Animal Sci.*, 1953, **12**, 828-835. [Dept. Animal Husb., Univ. Wisconsin, Madison.]

Nine groups of 9 pigs received a basal all-vegetable ration. Aureomycin was added at 20 mg. per kg. ration either continuously, or intermittently for 3 or 10 days at a time, or during the early, middle or late parts of the fattening period. The results were complicated by an outbreak of bloody dysentery with high mortality.

Aureomycin controlled the dysentery and significantly reduced the number of deaths; the best effect was obtained when it was given continuously. Losses were least when aureomycin was given early in life, but the final weight gain was the same whether it was given early or late. Pigs which received aureomycin continuously through the whole experiment were heavier than those which had it only part of the time.—D. Duncan.

5486

PERRY, T. W., THRASHER, G. W. and BEESON, W. M. **The effect of bacitracin implants on weaning weights and subsequent feed lot performance of two-day old pigs.** *J. Animal Sci.*, 1953, **12**, 824-827. [Dept. Animal Husb., Purdue Univ., Agric. Exp. Stat., Lafayette, Ind.]

Half the pigs in each of 6 litters had a pellet of 22.5 mg. bacitracin implanted subcutaneously at 2 days of age. After weaning at 6 weeks half these pigs and half the control (no bacitracin) pigs received 7.5 mg. aureomycin hydrochloride per lb. feed and the rest the same diet without aureomycin. All were fed to 200 lb. liveweight.

The bacitracin had no effect on weaning weight or on subsequent performance with or without aureomycin. Aureomycin significantly improved growth and feed efficiency whether bacitracin had been given or not.—D. Duncan.

5487

PIERCE, E. A. **The effects of rations containing antibiotics and trace mineral salt on the chemical composition and physical characteristics of pork carcasses.** *J. Animal Sci.*, 1954, **13**, 338-345. [Dept. Animal Husb., S. Dakota Agric. Exp. Stat., College Station.]

To the basal ration of 4 groups of pigs aureomycin-vitamin B₁₂ or terramycin supplements were added from weaning to 125 lb. liveweight or from weaning to slaughter weight at 200 lb. Another group got a supplement of trace minerals instead of the usual simple common salt mineral mixture. Analyses and appraisal of carcasses showed that there was no difference between the groups, though the supplemented groups tended

to have more fat. Chemical analysis of the fat showed a slightly higher moisture content in the supplemented groups.—T. D. Bell.

5488

ROBINSON, K. L., COEY, W. E. and BURNETT, G. S. **The response of pigs to dietary procaine penicillin.** *Empire J. Exp. Agric.*, 1953, **21**, 275-282.

With the time taken by pigs of 60 to 70 lb. liveweight to eat a limited ration as criterion, it was shown that the addition of 2 mg. procaine penicillin per lb. feed stimulated appetite, whether the ration was all-vegetable or contained white-fish meal. The extra palatability of the latter reduced the time compared with the all-vegetable ration, and in all cases procaine penicillin decreased the time still further. The response was greater on the less palatable diet. With weanling pigs fed from 30 to 100 lb. liveweight to appetite on meal containing white-fish meal the addition of procaine penicillin did not increase feed consumption: the observed increase in rate of liveweight gain was probably due to the increased efficiency of feed conversion. Comparing the same groups of pigs from 100 to 210 lb. liveweight, penicillin being withdrawn at 100 lb. liveweight, the rate of gain of the formerly supplemented groups was less than that of controls. In one group the penicillin was not withdrawn and daily liveweight increase was slightly better than in controls. With pigs fattened from 100 to 210 lb. liveweight which had not previously had any antibiotic, on a meal containing white-fish meal, the response to procaine penicillin was slight as regards rate of gain, but feed efficiency was greater.—T. D. Bell.

5489

DAVEY, R. J. and STEVENSON, J. W. **Comparison of effect of levels of aureomycin on reproduction in swine.** *J. Animal Sci.*, 1953, **12**, 912-913. *Proc.* [U.S. Dept. Agric.]

5490

FOWLER, S. H. and ROBERTSON, G. L. **Some effects of source of protein and an antibiotic on reproductive performance in gilts.** *J. Animal Sci.*, 1953, **12**, 946. *Proc.* [Agric. and Mech. Coll. Texas.]

5491

LASLEY, J. F., TRIBBLE, L. F., CASE, A. A. and PENROD, E. J. **The influence of porcine gamma globulins and antibiotic pellets on the growth and survival of baby pigs.** *J. Animal Sci.*, 1953, **12**, 923. *Proc.* [Missouri Agric. Exp. Stat.]

5492

- CLAWSON, A. J., SHEFFY, B. E. and WILLMAN, J. P. **The value of implanted antibiotic pellets for suckling pigs.** *J. Animal Sci.*, 1953, **12**, 911. *Proc.* [Cornell Univ.]

5493

- WALLACE, H. D., MCKIGNEY, J., PEARSON, A. M. and CUNHA, T. J. **The effect of aureomycin on the growth of pigs fed limited rations.** *J. Animal Sci.*, 1953, **12**, 935. *Proc.* [Florida Agric. Exp. Stat.]

5494

- BARBORIAK, J. and SCHÜRCH, A. **Versuche zur Feststellung der Wirkung beschränkter VEL-Mengen in tierischen Futtermitteln. [Effect of limited amounts of VEL in animal feeds.]** *Mitt. Schweiz. Landwirtsch.*, 1953, **1**, 172-175. [Inst. Haustiernährung, Eidg. Tech. Hochschule., Zürich.]

Peasants often give dishwater to pigs on account of the remains of food in it, and the fear has arisen that the presence of the widely used detergent VEL or PEO (Colgate-Palmolive A.G., Zürich) may give rise to digestive troubles. An 8-week feeding experiment was therefore made with groups of 20 male and 20 female rats about 4 weeks old at the outset. No significant effect on growth was found when 0.2, 0.5 or 1.0 per cent. VEL was added dry to the Institute's usual ration for growing rats, or when VEL was dissolved in water and used to moisten the feed. Organs examined at post mortem were normal. Since the 0.2 per cent. level would correspond to the case of a 60 or 70 kg. pig getting 3 kg. dry feed and 10 litres of water containing 6 g. VEL, it was concluded that dishwater containing VEL is unlikely to hurt pigs.—W. M. Deans.

5495

- SHEFFY, B. E., CLAWSON, A. J. and WILLMAN, J. P. **The value of surfactants in rations for growing-fattening pigs.** *J. Animal Sci.*, 1953, **12**, 931. *Proc.* [Cornell Univ.]

5496

- BRATZLER, L. J. and MARGERUM, E. P. (Jr.) **The relationship between live hog scores and carcass measurements.** *J. Animal Sci.*, 1953, **12**, 856-858. [Dept. Animal Husb., Michigan Agric. Exp. Stat.]

Three experienced judges assessed 434 live pigs for percentage of high value cuts, average backfat thickness and length of carcass. The pigs were then slaughtered and the true measurements were correlated with the estimated scores. Judging was most accurate for backfat thickness and length, especially for pigs in the lighter weight ranges,

and least accurate for the percentage yield of high value cuts. It was concluded that considerable training and experience are necessary to grade accurately live pigs of all weights into grades based on carcass measurements.—I. A. M. Lucas.

5497

- CRAMPTON, E. W., ASHTON, G. C. and LLOYD, L. E. **Improvement of bacon carcass quality by the introduction of fibrous feeds into the hog finishing ration.** *J. Animal Sci.*, 1954, **13**, 327-331. [Fac. Agric., Macdonald Coll., McGill Univ., Que.]

The introduction of fibrous feeds to replace the more digestible parts of a fattening ration increased the percentage of grade A carcasses, owing to an increase in the proportion of lean to fat. The fibrous feeds were alfalfa, wheat bran or wild oats, and they were combined with basal rations of oats, wheat or barley. The improvement was due to decreased rate of daily liveweight gain and longer finishing period when alfalfa or wheat bran replaced half the wheat or barley; when the basal ration was entirely oats, without replacement, the same effect was seen. When 25 per cent. of the basal ration was replaced by wheat bran or wild oats there was also an improvement, although rate of gain was not altered. It is suggested that in this case there must be something inherent in the feed to account for the improvement.

T. D. Bell.

5498

- COLE, J. W., RILEY, C. E., SMITH, H. J. and HOBBS, C. S. **The effect of type and weight on the yield of primal and miscellaneous pork cuts.** *J. Animal Sci.*, 1953, **12**, 900. *Proc.* [Univ. Tennessee.]

5499

- ZOBRISKY, S., BRADY, D. E. and LASLEY, J. F. **Significant relationships in pork carcass evaluation.** *J. Animal Sci.*, 1953, **12**, 904-905. *Proc.* [Univ. Missouri.]

5500

- WARREN, W. M. and DICKERSON, G. E. **Components of performance in selecting for heterosis in swine.** *Missouri Agric. Exp. Stat. Res. Bull.* No. 511, November 1952, pp. 71.

Pigs of 2 inbred Poland China lines were cross-bred with 9 different strains of 5 breeds to give 18 crosses, with reciprocal matings of each. In all, 807 pigs were born, growth studies were made on 521 and carcass measurements on 274. Pigs born in spring were reared on pasture with access to shelled maize and a protein supplement and autumn pigs in dry lot with free or restricted feed intake. Feed recording started at weaning, at 56 days of age, and pigs were slaughtered at 200 lb.

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From 2 to 6 spring-born gilts of each cross, 81 in all, were mated and slaughtered 15 to 30 days later for counts of ovulations and of embryos. The statistical methods employed are fully discussed.

Indices for selection are constructed on the prolificacy of crossbred gilts, the rate of gain of progeny, feed consumption per 100 lb. liveweight increase, and carcass merit as indicated by the yield of loin. Iowa Landrace crosses were significantly superior to all others except Beltsville Landrace and outbred Durocs. Limited feeding reduced the mean returns for all crosses, but increased the returns from outbred Duroc crosses, which tended to become too fat on unrestricted feeding.—D. Duncan.

5501

BLUNN, C. T., WARWICK, E. J. and WILEY, J. R.
Interrelationships of swine weights at three ages. *J. Animal Sci.*, 1954, 13, 383-388. [Univ. Nebraska.]

Weights were recorded at birth and at 56 and 154 days of age from 491 purebred and crossbred pigs farrowed by gilts in spring and reared on pasture in Indiana in 1947-49; 606 mixed crossbred pigs farrowed by gilts in autumn at Lincoln, Nebraska, in 1947-50; and 797 inbred Duroc pigs reared by gilts and yearling sows in spring and autumn at North Platte, Nebraska, in 1948-50. Thus both genetic make-up and management differed.

The average birthweights were similar at all 3 places, but Indiana pigs grew faster and were heavier at 56 and 154 days than any Nebraska group except Lincoln 1950 autumn pigs. There were statistically significant positive correlations between weights at birth and 56 days ($r = +0.53$), at birth and 154 days ($r = +0.40$) and at 56 and 154 days ($r = +0.63$), but while the regressions are large enough to indicate the desirability of heavy birthweight the coefficients of determination (r^2) indicate that birthweight is a relatively poor indicator of future weight or gain. Similarly, weight at 56 days accounts for only 40 per cent. of the variance in weight at 154 days, so selection on weight at 56 days is not very efficient. Selection of litters with large numbers of pigs alive at 56 days would accomplish nearly as much in selecting for heavy litter weights at 154 days as would selection on weight at 56 days.—D. Duncan.

5502

BRADFORD, G. E., CHAPMAN, A. B. and GRUMMER, R. H.
Time of farrow and performance in spring farrowed pigs. *J. Animal Sci.*, 1953, 12, 848-855. [Dept. Genetics, Univ. Wisconsin, Madison.]

An analysis is given of litter records from 445

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Wisconsin farms for the years 1947 to 1950. The numbers of pigs farrowed, the viability to 154 days of age and the litter weights at 154 days of age were recorded for gilts' litters farrowed during a period ranging from early January to early June of each year. Within this range of dates the period at which the gilts farrowed had little apparent effect upon any of the measures studied. This is important because in Wisconsin the greatest numbers of pigs are farrowed during March and April, which causes a very heavy supply of pigs to the packing stations in the autumn and a consequent fall in prices.—I. A. M. Lucas.

5503

LUCAS, I. A. M.
Some further observations upon pigs reared in cold pens. *J. Agric. Sci.*, 1954, 44, 369-376. [Rowett Res. Inst., Bucksburn, Aberdeenshire.]

Pigs were reared in a cold environment in pens with concrete floors. Some pens were well drained and the straw bedding was kept dry; other pens were continually damp until the pigs were weaned at 9 weeks, after which dry bedding was provided. The pigs were creep-fed from 8 weeks and were kept in the pens in groups of 4 from weaning to bacon weight. Owing to losses of litters the numbers of pigs were too small for satisfactory analysis of the results. The average relative humidity (R.H.) in the 9 weeks before weaning was about 80 to 85, with a range from 60 to 95 per cent. Air velocity near ground level in the pens varied with the weather from 11 to 30 ft. per min.

Four of the 16 pigs in each group died before weaning; there was only one rather doubtful diagnosis of liver disease, in the wet floor group. All the survivors were weaned in reasonable health, and a rather lower weaning weight in the wet floor group was accounted for by a single small deformed pig. No anaemia occurred.

After the pigs were weaned the air temperature in the piggery rose steadily except for a cold spell 4 to 5 weeks later, and the mean R.H. fell to 75 per cent. Three pigs from the wet floor group were killed at 40 weeks and showed signs of liver disease. It was considered that 2 of them developed the disease at 13 to 15 weeks of age, when a check in growth occurred, and the third at 20 to 22 weeks. There was no significant difference in feed efficiency or carcass quality in the other pigs, though pigs reared on wet floors were shorter and fatter than those from dry pens.—D. Duncan.

5504

PUHAČ, I. and HRGOVIĆ, N.
[A contribution to the study of local climate in piggeries.] *Acta vet., Belgrade*, 1954, 4, 15-27. [Inst. Vet. Hyg.] English summary.

Internal and external temperatures, rate of air-flow, cooling and radiation, and humidity of 16 piggeries in Vojvodina were measured during the 4 months from December to March. The floor space, surface area, cubic space, air supply and heat losses were calculated for a pig of 60 kg.

The information obtained indicated the importance of warmth in piggeries. In good farrowing houses there was a difference of 10° C. between

the internal and external temperatures, and good results were obtained at an internal temperature of 10° C. In houses for other pigs the difference was 6° to 8° C. Floor space, surface area, cubic space and air supply per pig were large. (From summary.)—T. D. Bell.

See also Absts. 4341, 4386, 4387, 4422, 4424, 4498, 4508, 4510, 4529, 4530, 4532, 4534, 5323.

GOATS, RABBITS AND OTHER MAMMALS

5505

MEREGALLI, A. Allevamento ed alimentazione della capra in Germania. [Goat breeding and feeding in Germany.] *Riv. Zootec.*, 1954, 27, 153-155.

5506

HUANG, T. C., ULRICH, H. E. and McCAY, C. M. Antibiotics, growth, food utilization and use of chromic oxide in studies with rabbits. *Federation Proc.*, 1954, 13, 462. [Animal Nutrit. Lab., Cornell Univ., Ithaca, N.Y.]

See also Abst. 4338.

POULTRY

GROWTH AND FATTENING

5507

HILL, F. W. and DANSKY, L. M. Studies of the energy requirements of chickens. 1. The effect of dietary energy level on growth and feed consumption. *Poultry Sci.*, 1954, 33, 112-119. [Agric. Exp. Stat., Cornell Univ., Ithaca, N.Y.]

Twenty chicks were fed from day-old on a control ration containing 20 per cent. crude protein and made up of soya bean oilmeal 12, crude casein 8, fishmeal 4, dried whey 2.4, minerals 3.5, vitamins, glucose 21, wheat 10 and maize meal to 100. In 11 weeks they had a mean feed consumption of 4363 g. and finished with a mean weight of 1491 g. A second group received a similar ration, but with 40 parts of oat hulls added at the expense of maize and wheat, with adjustments in the levels of soya bean and casein to keep the protein content constant. These ate 5448 g. of their ration per head, and weighed 1456 g. Although the second group ate a greater weight of feed, their calculated intake of productive energy was only 6064 Cal. as compared with 9374 Cal. for the first group. Also, although the liveweight gains were similar, the carcasses of the first group contained 27 per cent. fat, and those of the second group only 16 per cent. The mean weight of the gizzards was 26 g. for the first group and 37 g. for the second. Further groups receiving 10 to 30 per cent. of oat hulls gave results intermediate for all these variables.

Another group received a mixture of 60 parts of control ration and 40 parts of oat hulls. In 11 weeks they ate 5329 g. per head, an amount estimated to contribute 6869 Cal. productive energy :

their mean liveweight was 1371 g. Performance was inferior to that obtained with oat hulls added at the expense of grains and with the protein kept at a constant level.

In a second growth trial oat feed and cellulose were compared as "inert" supplements. At the 20 per cent. level growth and feed consumption were similar with each supplement. At the 40 per cent. level the chicks ate more of the "oat hull" ration; it was considered that the greater bulk of the "cellulose" ration prevented the chicks from increasing their feed intake further to compensate for the low energy content of the ration.—K. J. Carpenter.

5508

PETERSON, D. W., GRAU, C. R. and PEEK, N. F. Growth and food consumption in relation to dietary levels of protein and fibrous bulk. *J. Nutrition*, 1954, 52, 241-257. [Dept. Poultry Husb., Univ. California, Berkeley.]

Chicks were fed from 9 to 29 days of age on a series of rations, each containing 2 per cent. soya bean oil and minerals and vitamins believed to cover their requirements with an ample margin. Boned acetone-extracted fishmeal, of known good quality, and rice hull cellulose were variable components, and each ration was completed with sucrose. With fishmeal contributing 21.3 per cent. protein, and no cellulose, chicks had a growth rate of 6.3 per cent. per day, calculated in terms of their mean bodyweight over the test period; with 12, 24, 36 and 48 per cent. of cellulose growth rates were 6.6, 6.0, 5.3 and 2.3 per cent., respectively. With increasing levels of cellulose, up to

N.A. and R., October 1954

24 per cent., feed consumption increased so that the intake of "metabolisable calories" remained constant. For the rations containing 36 and 48 per cent. cellulose the volume of feed eaten remained the same as for the 24 per cent. ration, and the energy intake was therefore reduced.

Rations of lower protein content were also tested. In the extreme case a ration with 5.3 per cent. protein and no cellulose failed to allow any growth; but the same ration supplemented with 12, 24 and 36 per cent. cellulose allowed increasing growth rates, 2.2 per cent. per day at the last level. Carcase analysis of selected birds showed that those that had received low-protein rations contained less protein but more fat than normal chicks. The addition of 12 and 24 per cent. cellulose reduced the fat content of the carcasses, regardless of the protein content of the rations.

It is concluded that chicks normally adjust their feed intake to provide them with "metabolisable calories" in a quantity related to their body size. There is, however, an upper limit to the bulk that they can take in. Growth will normally be limited by energy intake; but with rations low in protein this will be the limiting factor. The apparent growth stimulation by cellulose with the 5.3 per cent. protein ration is thus explained as being directly due to the greater feed and therefore greater protein intake as the energy content of the ration is reduced.

In a further trial the addition of either 2.0 per cent. calcium gluconate or 0.1 per cent. levulinic acid to the same type of ration had no growth-stimulating effect. Levels of both 15 and 20 per cent. protein were used, and the trial was replicated with and without the addition of 12 per cent. cellulose.—K. J. Carpenter.

5509

KINDER, Q. B. and KEMPSTER, H. L. **Experiments in chick feeding 1947-1952.** *Missouri Agric. Exp. Stat. Res. Bull.* No. 525, July 1953, pp. 24.

In the large series of growth tests described the rations were based on yellow maize meal and soya bean meal, deficient in riboflavin. Riboflavin was added as alfalfa meal, dried milk or crystalline riboflavin and the effect was also tested of addition of meat scrap, fishmeal and iodinated casein.

In battery tests addition of alfalfa meal, though preventing curled toe, tended to depress growth to 8 weeks, each 1 per cent. addition over the 1.5 per cent. level depressing growth by nearly 2 per cent.; 5 per cent. alfalfa supplied all the riboflavin required, since the further addition of crystalline riboflavin gave no extra growth response. Crystalline riboflavin could replace dried milk or alfalfa as a source of riboflavin. Replacement of

part of the soya bean meal by 5 per cent. fishmeal gave a 10 per cent. increase in rate of growth and improved efficiency of feed. The continuous addition of iodinated casein, 18 g. per 100 lb. feed, depressed growth but the effect was less marked if the ration contained fishmeal. The use of wheat by-products instead of whole wheat had an adverse effect on growth and feed use. Dried fermentation solubles was a satisfactory source of riboflavin.

From a series of tests on the value of adding vitamin B₁₂, antibiotics and fishmeal to a maize and soya bean meal ration, singly or in combination, it was concluded that vitamin B₁₂ improved growth rate by about 9 per cent., antibiotics by a further 8 per cent. and fishmeal by a further 5 per cent. Under farm brooding conditions built-up litter improved growth rate to 8 weeks only if the ration was deficient in animal protein and vitamin B₁₂. The use of 15 to 20 per cent. of wheat shorts and bran reduced the energy value of the ration of soya bean meal and maize by 2.6 Therms per 100 lb. and resulted in a 2 to 2½ per cent. decrease in growth rate and use of feed was less efficient by 6 per cent.—J. S. Thomson.

5510

DENTON, C. A., LILLIE, R. J. and SIZEMORE, J. R. **Effect of egg yolk, fat and fish solubles on growth of chicks.** *Federation Proc.*, 1954, **13**, 455. [Bur. Animal Indust., U.S. Dept. Agric., Beltsville Md.]

5511

BRIGGS, G. M. and SPIVEY, M. R. **Growth-stimulatory effect of lactose added to synthetic diets for chicks.** *Federation Proc.*, 1954, **13**, 452. [Lab. Biochem., Nat. Inst. Health, Bethesda, Md.]

5512

SWART, L. G. and LIEBENBERG, C. R. **Lupins in chick rations.** *Farming in S. Africa*, 1954, **29**, 227-229. [Stellenbosch-Elsenburg Coll. Agric., Stellenbosch.]

Sweet yellow lupin seed meal could be used, up to 15 per cent. of the total ration for chickens, but it is recommended that not more than 10 per cent. should be used, replacing about 37 per cent. of the fishmeal normally used. Higher amounts had a detrimental effect on growth and conversion of feed. Bitter blue lupin seed meal, even at a 10 per cent. level, proved an unsuitable protein supplement.—J. S. Thomson.

5513

WIETLAKE, A. W., HOGAN, A. G., O'DELL, B. L. and KEMPSTER, H. L. **Amino acid deficiencies**

of casein as a source of protein for the chick.

J. Nutrition, 1954, **52**, 311-323. [Dept. Agric. Chem., Coll. Agric., Univ. Missouri, Columbia.]

In a series of trials chicks were fed from hatching to 4 weeks of age on a basal ration made up of casein 35, soya bean oil 10, salts 5, cellulose 3, DL-methionine 0.5, quantities of all the crystalline vitamins known to be needed by chicks, and glucose to 100. If no supplement was given feathering was poor, some chicks developed an abnormal gait and they finished with a mean weight below 150 g.

Performance was much improved when the rations were supplemented with either 1.5 per cent. creatine and 0.5 per cent. L-arginine or with 10 per cent. gelatine at the expense of casein, but was not equal to that obtained with a combined supplement of creatine, arginine and 1.5 per cent. glycine. The variability in final bodyweight (with a mean of over 350 g.) was also considerably less with the last ration than with those supplemented only with gelatine or with only arginine and creatine.

Creatine was not essential to optimum performance, as equally good results were obtained with a supplement of 1.24 per cent. arginine and 1.5 per cent. glycine. There is a suggestion from the results that male chicks require more arginine than females.—K. J. Carpenter.

5514

TARR, H. L. A., BIELY, J. and MARCH, B. E.

The nutritive value of herring meals. 1. The effect of heat.

BISSETT, H. M. and TARR, H. L. A. **2. Effect of heat on availability of essential amino acids.** *Poultry Sci.*, 1954, **33**, 242-250; 250-254. [Pacific Fish. Exp. Stat., Vancouver.]

1. The commercial meals were prepared by cooking, pressing and direct flame drying to give a meal of average quality, while the low-temperature meals were prepared by drying the pressed cake at 37° to 43° C. for 24 hr. in a rapid air stream. Some portions of this latter meal were subsequently heated for 30, 60 and 180 min. at 149° C.

The meals were incorporated at a 12 to 13 per cent. level in rations containing maize and soya bean oilmeal and gave rations of 18 to 20 per cent. protein. These feeds were given to groups of 20 day-old New Hampshire chicks. The commercial meals did not give such a good growth response as the low-temperature meal; heating the latter to 149° C. for 60 min. improved the nutritive value. The basal ration alone gave as good growth as the rations containing the low-temperature meal. In a second experiment, all the experimental rations contained 20 per cent. protein and were supplemented with vitamin B₁, vitamin B₆, inositol, p-aminobenzoic acid, folic acid, menadione and

α-tocopherol. The rations containing the commercial meals allowed about the same growth as the rations containing the low-temperature meal. Again the feeding value of the low-temperature meal was improved by heating to 149° C. except when the extra vitamins were given. In a third experiment, groups of 22 New Hampshire day-old chicks were given a 21 per cent. protein ration containing the herring meals with either the vitamin supplement previously used or 2 g. procaine penicillin G per ton of feed. The addition of either the vitamin supplements or the antibiotic improved the growth of chicks receiving the commercial herring meals to make them comparable with those receiving the low-temperature meal.

In further tests, groups of 22 day-old White Leghorn chicks were given rations containing ground yellow maize and the herring meals, including a low-temperature one heated to 149° C. for 180 min. The superior nutritive value of the low-temperature over the commercial meal was confirmed, and subsequent heating of the low-temperature meal at 149° C. for 180 min. greatly reduced its nutritive value. The addition of 100 g. L + lysine HCl per 100 lb. feed did not improve its value.

It was further shown that when the previous vitamin concentrates or 0.25 per cent. Aurofac was added to a yellow maize ration containing 19 per cent. commercial meal, the latter had a nutritive value equivalent to the low-temperature meal. Addition of the individual vitamins in the mixture to a similar basal ration showed that folic acid at 0.0227 g. per 100 lb. feed produced a growth response only slightly less than the complete mixture. Supplements of 3 per cent. liver meal or 5 per cent. dried whey or dried cereal grass gave a growth response similar to that of folic acid. Addition of liver meal or dried brewer's yeast with folic acid had no supplementary effect over that of folic acid alone.

In all these experiments, the different herring meals had not been prepared from the same batch of fresh herring. When this was done and feeding trials were made, the results were similar.

2. The meals used in this experiment were those produced for the feeding trials just described. Amino-acids measured after enzyme hydrolysis compared with those measured after chemical hydrolysis indicated the biological availability of the compounds. On this basis there was very little difference between the lots of raw fish and the presscake or meal produced by any process except for exposure to 159° C. for 180 min. In meal so treated, the availability of all the essential acids was much reduced. The most affected amino-acids were tryptophan, lysine, methionine, threonine and valine, all of which readily take

part in the Maillard reaction. Free ribose and deoxyribosenucleic acid content were estimated and it was shown that these substances are liberated on extensive heating and combine with amino acids in the Maillard reaction to give browning in the meal.—M. J. Head.

5515

REED, J. R. (Jr.), QUISENBERRY, J. H. and COUCH, J. R. **Use of supplementary methionine at low levels in broiler rations.** *Poultry Sci.*, 1954, **33**, 41-47. [Substat. 21, Texas Agric. Exp. Stat., Gonzales, Tex.]

In each of the experiments reported, groups of 100-day-old chicks were reared in pens providing 1 sq. ft. per bird. In experiment 1 four different soya bean oilmeals, (1) solvent-extracted soya bean meal (41 per cent. protein), (2) as for (1) (50 per cent. protein), (3) overheated expeller extracted soya bean meal (41 per cent. protein), (4) a commercial expeller meal (41 per cent. protein), and (5) a mixture of (2) with equal parts of cottonseed meal (41 per cent. protein) low in gossypol, were used in compounding maize plus milo, soya bean meal type rations for New Hampshire chicks reared on sand litter. Each basal ration was duplicated with one containing a supplement of 3 per cent. fishmeal, the soya bean meal being adjusted to keep the protein level constant; each of these 10 rations was duplicated with one containing a supplement of 0.05 per cent. DL-methionine. To 10 weeks of age, the methionine supplement produced an increase in growth and feed efficiency; the increased growth rate was apparent in the presence of fishmeal but not in the groups given the overheated meal or the commercial expeller meal. Better feathering was found on the birds given methionine, even in the presence of fishmeal.

In experiment 2, a basal ration of 30 per cent. maize, 29.5 per cent. milo and 32 per cent. soya bean meal (41 per cent. protein), specially fortified with 200 mg. choline chloride per lb. feed, was given with supplements of 5, 10, 40 and 60 mg. bacitracin per lb. for the first 4 weeks, reduced to 5 mg. bacitracin per lb. to 8 weeks; 4 further groups received supplements of a bacitracin-penicillin mixture given to provide 2.5, 10, 20 and 30 mg. bacitracin and 0.5, 2, 4 and 6 mg. penicillin per lb. feed, respectively, to 4 weeks of age. All rations were duplicated with a 0.05 per cent. DL-methionine supplement. Regardless of antibiotic supplementation, the methionine improved growth and feed efficiency.

In experiment 3, the basal rations were similar to those in experiment 2 with and without 3 per cent. condensed fish solubles, each with 5 mg. bacitracin or 2 mg. procaine penicillin per lb. feed; all rations were duplicated with 0.05, 0.025 and 0.0125 per cent. DL-methionine. No improve-

ment in growth due to methionine was found, although feed efficiency was improved.

It is concluded that overall a supplement of 0.025 per cent. methionine produces nearly as much growth improvement as 0.05 per cent., but that the improvement at the 0.0125 per cent. level is not always recognisable with the type of ration used in these experiments.—M. J. Head.

5516

GORDON, R. S., MADDY, K. H. and KNIGHT, S. **Value of methionine hydroxy analogue supplementation of broiler rations.** *Poultry Sci.*, 1954, **33**, 424-425. [Dept. Res., Monsanto Chemical Co., Everett, Mass.]

Groups of day-old New Hampshire male chicks were given a basal ration of yellow maize 57, soya bean oilmeal 35 and alfalfa meal 3 per cent., with mineral and vitamin additions. The following supplements were tested: (1) 0.05 per cent. methionine hydroxy analogue, (2) 2.5 per cent. fishmeal, (3) supplements (1) and (2) together, (4) supplement (2) plus 2 per cent. whey, (5) supplements (4) and (1) together. To 10 weeks of age there was no difference in liveweight gain between the groups, but those receiving methionine hydroxy analogue showed a significantly superior feed efficiency.—M. J. Head.

5517

ALMQUIST, H. J. and MERRITT, J. B. **Relation of fiber level in mash and grain to gain and economy of Broad Breasted Bronze turkeys.** *Poultry Sci.*, 1954, **33**, 434-435. [The Grange Co., Modesto, Calif.]

Groups of from 170 to 180 14-week-old turkeys were given one of three 20 per cent. protein mashes in which the proportions of milo, maize, barley and millrun were varied to give mash fibre levels of 5.7, 6.6 and 7.5 per cent.; a choice of milo or barley grain was given in addition. All feeds were available to the groups free choice at all times. The hens were fit for the table at 24 weeks and the toms at 27 weeks of age. Both hens and toms increased the proportion of the low-fibre grain, milo, eaten as the level of fibre in the mash increased. In all cases the birds selecting milo grain grew faster than those selecting barley. After 20 weeks of age, when the grain intake was proportionately higher than before, the fibre level of the total diet was closely related to feed efficiency for toms, but not with hens until the level of 6.5 per cent. fibre in the ration was reached.

M. J. Head.

5518

BUCKNER, G. D., INSKO, W. M. (Jr.), HENRY, A. H. and WACHS, E. F. **The comparative rates of growth and ossification of the femur, tibia and metatarsus bones of the male and**

female New Hampshire chickens having crooked keels. *Poultry Sci.*, 1954, **33**, 397-400. [Kentucky Agric. Exp. Stat., Lexington.]

The data for this study were obtained from groups of 8 male and 8 female chickens with crooked keels withdrawn from a large flock every 2 weeks from the 8th to the 28th week of age. To the 14th week of age, the percentage gain of the leg bones was similar in both sexes, although the males were heavier than the females. Thereafter the bones of the male grew rapidly to maturity at the 20th week, but the metatarsus of the female grew very little after the 14th week; the other 2 bones of the female grew most rapidly after the 20th week. The volumes of these 3 leg bones reached a maximum at the 20th week in both males and females. The ash percentage in all 3 bones in males and females varied little to the 20th week, when it began to increase in all bones but most rapidly in females. The percentage of Ca in the bone ash remained constant. A comparison of the data with that from birds with straight keels (Abst. 2936, Vol. 20) revealed no difference for any character, and in all instances males were heavier than the females.—M. J. Head.

5519

HIXSON, O. F. and ROSNER, L. Effect of unidentified factors in yeast on growth and hock disorder of turkey poults. *Poultry Sci.*, 1954, **33**, 66-68. [Laboratory of Vitamin Technology, Inc., Chicago, Ill.]

Groups of 14 or 15 three-day-old Broad Breasted Bronze female poults (Cornell University strain) were given an adequate maize and soya bean meal ration supplemented with 5 per cent. of 3 different brewer's yeasts, 2 different "primary grown" yeasts and 1 torula yeast. The groups were reared on wire floors to 8 weeks of age. The birds receiving the yeast supplement were heavier than the controls at 4 and 8 weeks but no difference was observed between the types of yeast.

In a further experiment, 7 groups of 12 day-old male chicks of the same strain were given a mixed maize, soya bean meal and casein ration supplemented with minerals and vitamins to 6 weeks of age. Six groups received a supplement of 5 per cent. yeast of the same types as in the first experiment. The incidence of enlarged hock in the unsupplemented group was 33 per cent. for the first 3 weeks, falling to 16 per cent. for the fourth, fifth and sixth weeks. The addition of the 3 brewer's yeasts and one of the primary grown yeasts considerably reduced the incidence, but the other 2 yeasts were less effective. A further group was given the basal ration with 10 mg. nicotinic acid and 40 mg. *d*- α -tocopheryl acetate per lb. feed, but this had no effect on the incidence.

M. J. Head.

5520

COMBS, G. F., ARSCOTT, G. H. and JONES, H. L. Unidentified growth factors required by chicks and poults. 3. Chick studies involving practical-type rations. *Poultry Sci.*, 1954, **33**, 71-79. [Dept. Poultry Husb., Univ. Maryland, College Park.]

Duplicate groups of 20 chicks were fed from day-old to 8 weeks of age on a ration made up of soya bean oilmeal 36, DL-methionine 0.05, minerals 4.5, vitamin A and D oil 0.25, choline chloride, nicotinic acid, riboflavin, calcium pantothenate, vitamin B₁₂, 2-methyl-1:4-naphthaquinone and yellow maize meal to 100. They finished with a mean weight of 781 g. Three similar groups that received the same ration supplemented with 1, 2 and 4 per cent. of butyl molasses fermentation solubles had a mean weight of 855 g. Two further groups that received the original ration supplemented with 2.5 and 5 per cent., respectively, of menhaden fishmeal finished with mean weights of 855 and 840 g. Lastly, 2 groups received the original ration supplemented in each case with 2 per cent. of butyl molasses fermentation solubles and also with either 2½ or 5 per cent. of fishmeal, and their mean finishing weight was 905 g.

The results of this and of 10 further growth trials in which these and other supplements were given singly and in combination led to the conclusion that chicks require 2 unknown growth factors for rapid growth, one of which is present in animal products (fish, meat and whale), and the other in fermentation by-products and dried whey. The activity of these factors appeared, however, to be reproduced by the introduction of 10 p.p.m. procaine penicillin into the chick rations. Also it is stated that in a proportion of trials no response is obtained with sources of these "factors" even in the absence of dietary antibiotics. Orotic acid added at a level of 33 p.p.m. appeared to have a growth-promoting action independent of the postulated factors and of dietary antibiotics.

K. J. Carpenter.

5521

PATTERSON, E. B. and MCGINNIS, J. Influence of hen diet on growth response of chicks to different sources of unidentified growth factors. *Federation Proc.*, 1954, **13**, 472. [Dept. Poultry Sci., Washington State Coll., Pullman.]

5522

SCHAEFFER, A. E., GREENE, R. D., SASSAMAN, H. L. and WIND, S. Fermentation meals as source of unidentified chick growth factors. *Federation Proc.*, 1954, **13**, 476. [E. R. Squibb and Sons, New Brunswick, N.J.]

5523

FRITZ, J. C., WHARTON, F. D. (Jr.) and HENLEY, R. M. **Effect of orotic acid on growth of chicks and poults.** *Federation Proc.*, 1954, **13**, 458. [Dawe's Lab., Inc., Chicago, Ill.]

5524

PALAFIX, A. L. and ROSENBERG, M. M. **An evaluation of low-grade sugar in starter and grower rations of chickens.** *Poultry Sci.*, 1954, **33**, 127-133. [Dept. Poultry Husb., Univ. Hawaii, Honolulu.]

Replicated groups of day-old New Hampshire chicks were given starter rations in which different amounts of a mixture of low-grade sugar and bagasse pith (10:1) was substituted for yellow maize meal. The ration containing the greatest amount of the sugar mixture (56.5 per cent.) was considered to be nutritionally adequate for normal growth. The growth rate of the chicks was inversely proportional to the amount of sugar mixture in the ration, but only those chicks given 56.5 per cent. sugar mixture were significantly smaller than the controls. Efficiency of feed conversion was also inversely proportional to the proportion of sugar mixture in the ration. Chick mortality rate was not affected by the feeding of the sugar mixture.

In trial 2, 48, 40 and 32 per cent. sugar mixture was substituted for yellow maize meal in the chick rations, but the proportions of herring meal and soya bean meal were adjusted to equalise the protein contents of the rations. Here the higher levels of the sugar mixture had no adverse effect on growth but birds receiving 32 per cent. sugar mixture were significantly smaller than the controls. Efficiency of feed conversion increased with an increase in the proportion of sugar mixture. Chick mortality was unaffected.

In trials 3 and 4, the experimental rations were given from the seventh to the fifteenth week of life to groups of 8-week-old New Hampshire cockerels housed in open-air wire-floor pens. In trial 3, groups of 17 birds were given rations containing up to 58.5 per cent. low-grade sugar in direct substitution for yellow maize meal. Only the group receiving the highest level grew significantly more slowly than the controls. The feed efficiency was inversely proportional to the concentration of sugar in the ration and there was no effect on mortality rate. The rations given in trial 4 to groups of 18 New Hampshire cockerels were similar to those in trial 3 except that the mixture of low-grade sugar and bagasse pith (10:1) was used instead of low-grade sugar alone. The birds given 19.5 or 39 per cent. sugar mixture grew at a rate similar to that of the controls, but those receiving 58.5 per cent. of the mixture grew significantly more slowly, and the feed efficiency

decreased as the proportion of sugar mixture in the ration increased.—M. J. Head.

5525

ROSENBERG, M. M. **An evaluation of B-grade molasses in chick starter rations.** *Poultry Sci.*, 1954, **33**, 382-389. [Dept. Poultry Husb., Univ. Hawaii, Honolulu.]

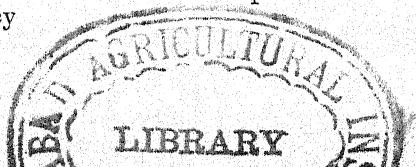
Duplicate groups of 20 day-old New Hampshire chicks housed in batteries were used.

In trial 1, the basal ration contained yellow maize 54, herring meal 10, soya bean meal 30 and alfalfa meal 3 per cent., supplemented with minerals and vitamins. A mixture of B-grade molasses and bagasse pith (5:1) was added at levels of 13.5, 27, 40.5 and 54 per cent. in direct substitution for yellow maize to give calculated protein levels in the ration of 25.7 per cent. for the control and 24.4, 23.2, 22.0 and 20.8 per cent., respectively, for other groups. At 21 days of age, all birds receiving the sugar mixture were smaller than the controls, but only those receiving the largest amount significantly so; feed efficiency was also lower than for controls on all the sugar rations and significantly so at the highest rate of substitution. At 6 weeks of age, the birds receiving 40.5 or 54 per cent. of the sugar mixture were significantly smaller than the controls, and the feed efficiency of all groups receiving the sugar mixture was significantly lower than for controls.

In trial 2, the basal ration was similar to that in trial 1, with the omission of herring meal. The sugar mixture was directly substituted for yellow maize meal at 32, 40 and 48 per cent., but small amounts of herring meal and soya bean oilmeal were given in addition to equalise the protein contents of the rations, at 20.3, 20.5 and 20.2 per cent., respectively; the basal ration contained 22.2 per cent. No significant difference in group chick weights was found although chicks receiving 48 per cent. sugar mixture had a lower feed efficiency.

In trial 3, graded amounts of herring meal and soya bean oilmeal were included in all rations. B-grade molasses was given at levels of 23.0, 29.5, 37.0 and 46 per cent. and at each level a low (over 37 to 1) and a high (5 to 1) level of bagasse pith was given. At the low levels of bagasse pith wheat bran was added. At 3 weeks of age all chicks had grown well but at each level of molasses intake those receiving the low level of bagasse pith with bran grew faster than the controls and those receiving the 5:1 mixture. Feed utilisation was best in groups receiving the low levels of bagasse pith. At 6 weeks of age, the male chicks receiving the normal 5:1 mixture were significantly lighter than the other birds at each molasses level; there was no comparable effect on the females.

M. J. Head.



5526

BROWN, W. O. **The effect of antibiotics on the growth rate of chicks fed high quality diets.** *Res. Exp. Rec. Minist. Agric. N. Ireland*, 1952, 54-59. [Minist. Agric. N. Ireland.]

Duplicate groups of Light Sussex pullet chicks were reared on litter in a brooder house and fed to 8 weeks of age on a ration (A) made up of livermeal 10, fishmeal 5, groundnut meal 5, cod liver oil 2, limestone 1, wheat feed 25, ground barley 15 and maize meal to 100; their mean weight gain was 775 g. Further groups fed on a similar ration (B), with the livermeal replaced by dried skimmed milk and the level of fishmeal increased to 10 per cent. at the expense of maize meal, had a mean gain of 795 g. Parallel groups receiving rations A and B each supplemented with 20 g. [misprinted as 4.0 g. in Table IV] procaine penicillin per ton had mean weight gains of 870 and 945 g., respectively. This mean increase of 15 per cent. in growth rate with the antibiotic was accompanied by a 10 per cent. improvement in efficiency of feed utilisation despite the high quality of the basal rations.

In two further trials, one in wire-floored cages and one using floor pens, there was a tendency for both terramycin and procaine penicillin, both used at a level of 4 g. per ton of feed, to increase growth by about 7 per cent., but the differences were not statistically significant with the numbers used.

K. J. Carpenter.

5527

SLINGER, S. J., PEPPER, W. F. and HILL, D. C. **High levels of antibiotics and white feathers in poults.** *Poultry Sci.*, 1954, 33, 211-212. [Dept. Poultry Husb., Ontario Agric. Coll., Guelph.]

A group of 20 Broad Breasted poults was fed to 4 weeks of age on a mash which included 6 per cent. of animal protein concentrates, 43 per cent. of soya bean meal and supplementary methionine, nicotinic acid and vitamin B₁₂. The mash showed, on analysis, 28.4 per cent. crude protein and 1.63 per cent. lysine. At 4 weeks of age the poults had a mean liveweight of 504 g., the feed to gain ratio was 1.91, and no case of white barring of the feathers was seen.

Three parallel groups received the same ration supplemented with procaine penicillin at levels of 4, 20 and 80 p.p.m., respectively. Their mean finishing weights were 550, 568 and 567 g. and the corresponding feed to gain ratios were 1.79, 1.64 and 1.74. Three further groups received aureomycin in their rations at levels of 10, 50 and 200 p.p.m., respectively, and finished with mean weights of 564, 606 and 568 g., and feed to gain ratios of 1.79, 1.60 and 1.63. None of the birds receiving an antibiotic showed white barring.

It is suggested that field reports of "white barring" as a result of the introduction of anti-

biotics into poult starting rations may be explained if the rations contain less lysine than in the present experiment, the lysine being then insufficient for the increased growth rates obtained with the antibiotics.—K. J. Carpenter.

5528

MACGREGOR, H. I., BLAKELY, R. M. and ANDERSON, R. W. **Antibiotics in the diet of turkey poults of various ages.** *Poultry Sci.*, 1954, 33, 36-38. [Dominion Exp. Stat., Swift Current, Sask.]

Two groups of day-old Broad Breasted Bronze poults were reared on an adequate practical ration, one group receiving 8.8 p.p.m. procaine penicillin in addition. At 8 weeks of age the birds were divided into 2 groups on the basis of corresponding weights, both groups being given an all-mash ration at pasture and one group receiving 4 p.p.m. procaine penicillin in addition. The mash was modified every 4 weeks to provide a decreasing amount of protein.

The addition of penicillin to the growing diet increased the growth rate of female poults which had received the antibiotic in the rearing stage. There was no effect on other groups to 20 weeks of age.—M. J. Head.

5529

WISMAN, E. L., BOUCHER, R. V. and CALLENBACH, E. W. **The influence of combining and interchanging antibiotics in chick diets.** *Poultry Sci.*, 1954, 33, 290-293. [Pennsylvania Agric. Exp. Stat., State College.]

A group of 26 chicks was housed in a wire-floored cage and fed to appetite to 10 weeks of age on a dry ration of soya bean meal 20, maize gluten meal 5, dried whey 3, dried yeast 3, choline chloride 0.12, alfalfa meal 2.5, vitamin B₁₂, riboflavin, minerals and yellow maize meal to 100. Their mean live-weight gain was 1230 g. and they used 2.86 g. feed per g. gain.

Five parallel groups received the same ration supplemented with 5 g. of an antibiotic per ton. This was either procaine penicillin, terramycin hydrochloride, a mixture of the two, or first one for 3 weeks and then the other. The mean gains of these groups ranged from 1383 to 1428 g., and the feed conversion rates from 2.47 to 2.63. Less favourable results were obtained, in general, in further groups where streptomycin was used, either by itself or in combination with one of the other antibiotics.

It is concluded that penicillin, terramycin, or a combination of the two at a total level of 5 g. free base per ton feed, is equally effective.

K. J. Carpenter.

5530

WISMAN, E. L., BOUCHER, R. V. and CALLENBACH, E. W. **The influence of an antibiotic, animal**

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protein, sex and rearing environment on chick growth. *Poultry Sci.*, 1954, **33**, 328-332. [Pennsylvania Agric. Exp. Stat., State College.]

This was a $2 \times 2 \times 2 \times 2$ factorial experiment in which 8 groups of 25 sexed New Hampshire chicks were housed in wire-floored brooders and 8 groups of 75 New Hampshire chicks in colony houses with shavings for litter. The animal protein ration contained fishmeal 5, meat scrap 2, bonemeal 0.75 and soya bean oilmeal 13 per cent.; the plant protein ration contained only soya bean oil meal 19.8 and bonemeal 2.2 per cent.; each ration contained 3 per cent. dried whey. The rations were given with or without 20 g. terramycin hydrochloride per ton of feed.

Each treatment had an effect; that is, chicks reared in batteries, male chicks, chicks given the animal protein ration and chicks given terramycin were significantly heavier at 12 weeks of age. Chicks receiving animal protein were heaviest when they were male, reared in a battery and not given antibiotic. Animal protein or terramycin produced comparable growth responses when added to the plant protein ration and the effect of both together was greater than that of either singly. There was no effect of sex on terramycin-induced gains, which were greatest in the early stages of growth and gradually decreased. Feed utilisation data are presented [but with no statistical analysis].

Data on variability of chick growth showed it to be greater in colony houses than in brooders, in males than in females, and in chicks receiving animal protein.—M. J. Head.

5531

ATKINSON, J. C., BOUCHER, R. V. and CALLENBACH, E. W. **The influence of terramycin and aureomycin on growth, variability, and efficiency of feed utilization in White Holland turkeys.** *Poultry Sci.*, 1954, **33**, 332-344. [Pennsylvania Agric. Exp. Stat., State College.]

A large control group (1) of turkey poults was reared in a wire-floored battery cage to 6 weeks of age, then transferred to a floor pen for 2 weeks, and finally to bluegrass range for 20 weeks. Up to 8 weeks of age the poults received a ration containing 25 per cent. crude protein and including 5 per cent. fishmeal, 4 per cent. dried whey and 4 per cent. dried yeast; after this time they received a ration containing 17 per cent. crude protein, with no fishmeal and 1 per cent. each of dried whey and dried yeast. Further groups received the same management and similar rations fortified with 4.5 g. aureomycin hydrochloride per ton either for the whole period (group 2) or for the first 8 weeks only (group 3).

At 8 weeks of age the mean weights in group 1 were 960 g. for females and 1150 g. for males; the corresponding means in the supplemented groups

were approximately 10 per cent. more for each sex. At 28 weeks the mean weights in group 1 were 11.0 lb. for females and 18.0 lb. for males, in group 2, 11.2 and 18.5, and in group 3, 11.3 and 17.2 lb. Statistical analysis showed no effect of treatment on the final weight of the females, and an improvement for males only when supplementation was continued after the eighth week. The individual weights were as variable in the supplemented groups as in the control group; and the proportion of deaths did not differ significantly between groups.

In two further experiments poults were taken only to 8 weeks of age, and at this point birds that had received a supplement of 4.5 g. terramycin hydrochloride per ton were from 4 to 10 per cent. heavier than control birds. In one trial 9.0 g. gave a greater effect than 4.5 g. per ton, and in the other 2.25 g. given to one group appeared more effective than 4.5 g. per ton given to another group.

Effects on efficiency of feed utilisation were smaller than the effects on rate of growth.

K. J. Carpenter.

5532

MARCH, B. E., BURDETT, M. and BIELY, J. **Antibiotics and surface active agents in chick nutrition.** *Poultry Sci.*, 1954, **33**, 300-304. [Poultry Nutrit. Lab., Univ. British Columbia, Vancouver.]

Duplicate lots, each of 20 chicks, were fed to 8 weeks of age on a ration of soya bean meal 13.4, herringmeal 6.7, liver meal 3, dried distiller's solubles 2, dried grass, bonemeal and other mineral supplements, vitamin A and D oil, nicotinic acid, choline chloride and equal parts of maize and wheat to 100; their mean finishing weight was 750 g. Parallel groups received the same ration supplemented with 1 per cent. of Tween-80 (polyoxyethylene sorbitan mono-oleate) and finished with a significantly heavier mean weight of 824 g. Further groups received the original ration supplemented with 3.3 p.p.m. procaine penicillin and had a mean weight of 835 g.

In a second trial chicks were fed to 4 weeks of age on a simplified maize and soya bean mixture fortified with minerals, vitamins A and D, choline, nicotinic acid, riboflavin and pantothenic, but not folic acid; their mean weight was 229 g. Other groups received the following supplements (mean weights in g. in parenthesis): 0.5 per cent. of Tween-80 (248), 0.8 p.p.m. folic acid (356), Tween-80 and folic acid (364), 3.3 p.p.m. procaine penicillin (359). Another test supplement, Santomerse-80 (an alkyl aryl sulphonate compound), used at a level of 0.1 per cent., gave chicks with a mean weight of 296 g.; when it was used in combination with folic acid the chicks weighed 384 g., and with penicillin 373 g.

In a third trial chicks were fed to 9 weeks of age on a series of rations each with and without the addition of 0.2 per cent. of Santomerse-80. On the basal ration, similar to that used in trial 1, the mean finishing weight was 775 g., and with the Santomerse-80 supplement it was 841 g. When procaine penicillin was also incorporated in the rations the corresponding weights were 850 and 841 g. On the basal ration supplemented with 2.5 to 7.5 per cent. of herring oil group weights ranged from 850 to 900 g., but on the same rations supplemented with Santomerse-80 the birds were no heavier, nor did the addition of Santomerse-80 further stimulate the growth of chicks receiving rations containing both herring oil and procaine penicillin.

In the last trial the addition of 0.1 per cent. of Santomerse-80 failed to stimulate the growth of chicks fed to 8 weeks of age on a ration similar to that previously used, but of higher protein content, whether it was supplemented with herring oil or not.

It is concluded that some of the differences in growth response arising from the introduction of surface-active agents into chick rations are related to differences in the composition of the basal rations used.—K. J. Carpenter.

5533

REID, B. L., ELAM, J. F. and COUCH, J. R. **The effect of oral and parenteral administration of antibiotics on growth and fecal microflora in the turkey poult.** *Poultry Sci.*, 1954, **33**, 307-309. [Dept. Poultry Husb., Texas Agric. and Mech. Coll. System, College Station.]

A group of 20 poults was reared to 10 weeks of age in a wire-floored cage and fed on a ration containing soya bean meal 60, mineral supplements 5, vitamin A and D oil, riboflavin, pantothenic acid, nicotinic acid, vitamin B₁₂ and maize-meal to 100; the mean finishing weight was 2050 g. Parallel groups receiving supplements of penicillin, aureomycin and bacitracin, each at a level of 33 p.p.m., weighed 2290, 2320 and 2391 g., respectively. Further groups receiving 4 mg. per bird weekly of these antibiotics by injection weighed 2190, 2460 and 2210 g., respectively.

Samples of excreta were taken from each cage at weekly intervals and bacterial counts were made by a technique previously reported (Abst. 3518, Vol. 21). Although the injection of aureomycin appeared to have the greatest effect on growth it had no detectable effect on the total dilution count, or on the numbers of enterococci, lactic acid bacteria or yeasts in the excreta. However, the group receiving these injections did give droppings with a greater number of aureomycin-resistant organisms than were found in the droppings from the control group.

The birds receiving injections of penicillin showed no detectable difference from the controls in their faecal counts, although differences had been reported in earlier papers (Abst. 1428, Vol. 22). The increased growth obtained in the present experiment with penicillin injection was not, however, considered to be significant.

K. J. Carpenter.

5534

ELAM, J. F., JACOBS, R. L., FOWLER, J. and COUCH, J. R. **Effect of dietary *Clostridia* upon growth-promoting responses of penicillin.** *Proc. Soc. Exp. Biol. Med.*, 1954, **85**, 645-648. [Dept. Poultry Husb., Texas Agric. Exp. Stat., College Station.]

For a feeding experiment with chicks from hatching to 10 weeks of age 2 rooms were used. A "clean" room was washed daily for 2 weeks before and throughout the whole period of the trial, and another "old" room was one that had been used continuously for chicks for 3 years and not specially prepared. Battery cages with raised wire floors were used in both. In the "old" room one group of chicks that received a control all-vegetable diet finished with a mean weight of 969 g. and a further group that had the same diet supplemented with 4.4 mg. penicillin per kg. finished with a mean weight of 1085 g. Similar groups that received these treatments in the "clean" room weighed 1167 and 1210 g., respectively.

Further groups in the clean room received diets supplemented with chick excreta that had been heated to kill aerobic organisms, at a level contributing about 90,000 clostridia per kg. diet. With this supplement alone the mean group weight was 1042 g. and with penicillin in addition it was 1180 g. A final group given a supplement of excreta that had been autoclaved to destroy all the micro-organisms weighed 1150 g. per head.

Samples of excreta were obtained weekly from the experimental groups, and their content of clostridia was ascertained. The control group in the "old" room gave excreta from which 16,000 were obtained per g.; the corresponding group in the "new" room gave 1200. The comparable figures for the penicillin-supplemented groups were 270 and 620, respectively. The dietary supplement of excreta in the "clean" room gave droppings in turn from which 10,000 per g. were obtained; but with penicillin in addition only 450 were counted.

Since similar results were obtained in a second trial, it was concluded that the depressed growth of chicks in "old" quarters may be at least partly due to a "build-up" of clostridia in their intestinal tract, and that the growth-promoting effect of penicillin by mouth may be associated with its action in reducing the numbers of these organisms.

K. J. Carpenter.

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5535

BEGIN, J. J. and THORNTON, P. A. **Response of hormone-injected New Hampshire chickens to antibiotic supplementation.** *Poultry Sci.*, 1954, **33**, 212-214. [Kentucky Agric. Exp. Stat., Lexington.]

Eight groups of 8 male and 8 female day-old chicks were given a maize and soya bean oilmeal ration with or without 10 mg. bacitracin per lb. feed. At 4 and 38 days of age, 4 males from each group were given a 20 mg. tablet of diethylstilboestrol subcutaneously in the neck and 4 females of each group had 20 mg. testosterone propionate similarly administered. Without the hormone, bacitracin feeding produced a 5 per cent. smaller gain in females and a 7 per cent. greater gain in males. All birds that received the hormone grew more slowly than the controls and the effect of bacitracin on these birds was similar to that in the untreated birds. The dose of hormone was sufficient to modify the secondary sex characters, but not to modify the differential sex response to antibiotic supplementation.—M. J. Head.

5536

BOBBY, F. C. and BELWORTHY, W. R. **Advantages of chemical caponisation of cockerels.** *N.Z. J. Agric.*, 1954, **88**, 19-21. [Poultry Demonstration Plant, Upper Hutt.]

Australorp × White Leghorn cockerels were caponised surgically or by stilboestrol implantation, and a group was left intact as controls. They were fed to 26 weeks on a grain and mash ration. They were weighed monthly, and feed intake was measured. Some birds were killed at 21 weeks old.

Caponisation by either method significantly improved carcase quality, but there was no difference between the methods. The advantage of implantation was that there was no danger of birds dying as a result of the operation, and no temporary set-back in growth. The quality of the caponised carcasses deteriorated from the 21st to the 26th week. Capons ate about 5 lb. more feed and weighed about $\frac{1}{2}$ lb. more than the intact cockerels.—T. D. Bell.

5537

RICHARDS, J. S. **Broilers. A Yorks North Riding experiment.** *Agriculture, J. Minist. Agric. Engl.*, 1954, **61**, 123-126. [Nat. Agric. Advisory Serv., Yorks and Lancs Province.]

In an experiment in rearing table poultry it was found that caponising at 7 weeks or giving an antibiotic increased the margin of profit; both treatments, however, showed no increase over the profit from a control untreated group. The most economical age for disposal of the birds was at 12 weeks.—J. S. Thomson.

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5538

PEPPER, W. F., SLINGER, S. J. and BERGEY, J. E. **Effect of 3-nitro, 4-hydroxyphenylarsonic acid on the growth and sexual maturity of pullets.** *Poultry Sci.*, 1954, **33**, 422-423. [Dept. Poultry Husb., Ontario Agric. Coll., Guelph.]

Two groups of 197 Columbian Rock female chicks were given adequate starting, growing and laying rations to appetite, with or without 45 g. 3-nitro-4-hydroxyphenylarsonic acid per ton of feed. The wood-shaving litter in the brooder and laying house pens was changed once in 10 weeks. Group chick weights were obtained at 6, 10 and 15 weeks of age and the birds were weighed individually at 20 weeks of age. The average live-weights of the chicks in the control and supplemented groups were 466 g., 1066 g., 3.39 lb. and 4.44 lb. and 562 g., 1188 g., 3.69 lb. and 4.73 lb., respectively, at these ages. The drug had no effect on mortality. Birds from both groups began laying during the 19th week, but by the end of the 20th week the supplemented group had produced 94 eggs, compared with 30 eggs for the control. Full data for egg production and hatching will be published later.—M. J. Head.

5539

NEX, L. F. and NEWELL, G. W. **The effect of a sodium alkyl aryl sulfonate detergent on the growth of chicks.** *Poultry Sci.*, 1954, **33**, 297-299. [Dept. Biol., Stanford Res. Inst., Calif.]

The basal ration used with day-old chickens was of yellow maize, soya bean oilmeal, alfalfa meal and fishmeal, with distiller's solubles, dried whey and minerals. The addition of a commercial Na alkyl aryl sulphonate detergent, at the rate of 2.0 g. active substance per kg. feed, produced a rate of growth to 12 weeks significantly higher, by 11 per cent., than that of unsupplemented controls. Addition of procaine penicillin, 3.3 mg. per kg., to the basal ration produced an earlier stimulation of growth than the detergent but at 12 weeks gains were similar. Phenylarsonic acid, 0.9 g. per kg., also significantly increased rate of growth. In each case feed conversion ratio was improved.

J. S. Thomson.

5540

BRANION, H. D. and HILL, D. C. **Detergents and chick growth.** *Poultry Sci.*, 1954, **33**, 62-66. [Dept. Nutrit., Ontario Agric. Coll., Guelph.]

Triplicate groups of 13 or 14 newly hatched Columbian Rock female chicks were reared on a wire floor for 12 weeks and given a basal ration containing 23 per cent. protein with a detergent supplement. The detergents were given as 0.5 per cent. of the ration and 10 p.p.m. procaine penicillin were given to one group. In experiment 1, the detergents used were Vel, Tide, Surf and

Dreft and in experiment 2 Fab, Duz [Daz?] and Rinso. Neither the detergents nor the antibiotic had any effect on liveweight compared with the controls at 14-day intervals to 12 weeks of age. Mortality was almost zero in both experiments. Theories of the possible mode of action of surface-active substances in other reported experiments are discussed.—M. J. Head.

5541

CARPENTER, K. J. **The place of new products in poultry feeding.** *J. Dept. Agric., Republic of Ireland*, 1952-53, **49**, 106-115. [Rowett Res. Inst., Bucksburn, Aberdeenshire.]

5542

MCDONOUGH, S. J. **Aspects of poultry nutrition in the United States of America.** *J. Dept. Agric., Republic of Ireland*, 1952-53, **49**, 116-157. [Dept. Agric., Dublin.]

5543

SLINGER, S. J., PEPPER, W. F. and MORPHET, A. M. **The prevention of perosis in turkeys with 4-nitrobenzenearsonic acid.** *Poultry Sci.*, 1954, **33**, 214-215. [Dept. Poultry Husb., Ontario Agric. Coll., Guelph.]

Two groups of 50 male and 50 female day-old Broad Breasted Bronze poults were assigned to groups by weight, brooded in colony houses with wood shavings as litter, and reared from the eighth to the twentieth week of age in slatted sun porches. The basal starting and growing rations contained animal protein and were given with and without 0.025 per cent. 4-nitrobenzenearsonic acid in the mash; as the growing poults received oats as scratch grain, the level of the drug was lower than 0.025 per cent. in the total ration. At 8 and 16 weeks of age there was no difference between the groups in liveweight, but at 20 weeks of age the males receiving the drug weighed significantly less than the controls. It is suggested that the difference in the effect of the drug over the age range may be accounted for by the limited access to droppings after 8 weeks of age. Perosis occurred only in the males on the control ration at 16 and 20 weeks of age, 17.7 and 25.5 per cent., respectively, being affected.—M. J. Head.

5544

HEYWANG, B. W. and BIRD, H. R. **The effect of alfalfa saponin on the growth, diet consumption and efficiency of diet utilization of chicks.** *Poultry Sci.*, 1954, **33**, 239-241. [Agric. Res. Admin., U.S. Dept. Agric., Bur. Animal Indust., Glendale, Ariz.]

In duplicate experiments groups of 10 day-old New Hampshire chicks were given a ration of

maize and soya bean oilmeal with or without 0.05, 0.10, 0.20 and 0.40 per cent. alfalfa saponin for the first 6 weeks of life; in the second experiment one group received 0.15 per cent. alfalfa saponin. In experiment 1, the chick liveweights at 6 weeks of age were 706, 692, 695, 618 and 518 g. and the efficiencies of feed conversion 0.478, 0.471, 0.478, 0.462 and 0.440, respectively. In experiment 2, the corresponding chick weights and efficiencies were 701, 692, 678, 678, 605 and 439 g., and 0.420, 0.423, 0.408, 0.423, 0.409 and 0.383. Feed consumption of the groups receiving the higher levels of saponin was about 200 g. less than that of the control chicks. No chick died in this experiment from saponin feeding and the highest level was equivalent to the inclusion of 50 per cent. alfalfa in the ration. Hence it is considered that saponin is not the only substance in alfalfa which has an undesirable effect on chick growth.—M. J. Head.

5545

DARROW, M. I. and STOTTS, C. E. **The influence of debeaking broilers upon growth rate, feed utilization, and market quality.** *Poultry Sci.*, 1954, **33**, 378-381. [Res. Labs., Swift and Co., Chicago, Ill.]

The data reported came from 10 field tests with over 14,000 birds on each treatment in 3 different broiler-producing areas in the United States. At 3 weeks of age, the birds had one-third to one-half of the upper beak removed by conventional electric debeaking equipment. The treated and normal birds were kept in separate halves of the same house. A mash with 21 per cent. protein, or pellets and mash, was given to all.

The average weight of the treated broilers in the 3 regions was 2.76, 3.20 and 2.83 lb. and of the normal broilers 2.77, 3.17 and 2.88 lb., respectively, giving an overall average weight of 2.91 lb. for the treated birds and 2.92 lb. for the control birds. In 7 tests the treated birds ate 0.1 lb. less feed per 1 lb. gain than the control normal birds; there was no difference in the remaining 3 tests. The improvement in efficiency of use of feed is attributed to less scattering of the feed. Feathering was better than average in all flocks; even so, 83 per cent. of the treated birds gave grade A carcasses compared with 73 per cent. of the controls.

In further experiments at 4 centres with White American, White American × White Rock, Delaware × New Hampshire and White Rock × New Hampshire breeds, the rates of growth and mortality in a group of 50 chicks debeaked electrically at 1 day old were compared with those of normal chicks. No difference in liveweight at 3 or 8 weeks of age was found and mortality was low in all groups.—M. J. Head.

5546

OLSSON, N. Korsnings- och uppfödningförsök med gäss. [**Crossbreeding and raising of geese.**] *Kgl. Lantbrukshögsk. Statens Husdjursförsök Medd.* No. 53, 1953, pp. 24. English summary.

The data refer to Swedish (Skåne) geese, Toulouse and Italian geese and crosses. Mean egg yields for the pure breeds in that order, over the laying season, were 20.8, 32.2 and 36.4. Hybrids approximated to or exceeded the yield of the more prolific parent. Fertility as a percentage of eggs laid was 33.3, 71.5 and 89.4 for pure breeds. Eggs from first crosses and hybrid birds were fertile. Of fertile eggs, the following percentages hatched: 29.8, 41.3, and 68.6; the hybrids did not always do better.

Statistical analyses are presented of all these data, and the relation of day-old gosling weight to egg weight.

Rates of growth from hatching to 140 days are shown in tables and graphs, with data for feed consumption during fattening (10.63 kg. oats per kg. weight gain), slaughter losses, and the relation of loss in feathers and in bleeding to slaughter weight. Slaughter weights of the purebred birds, male and female, in the same order as above, after a 12-hr. fast, were approximately 8.8 and 6.6, 7.2 and 6.0 and 5.5 and 5.0 kg.—I. Leitch.

5547

MORLEY, F. H. W. and SMITH, J. (with FORGE, R. M. and MASTERS, F.) **A comparison between reciprocal crosses of Australorps and White Leghorns.** *Agric. Gaz. N.S.W.*, 1954, 65, 17-21.

Comparisons were made between 399 progeny of White Leghorn males and Australorp females (W/B) and 512 progeny of the reciprocal cross (B/W). The birds came from 3 different sources.

Average results were as follows for W/B and B/W cross progeny, respectively: early mortality 6.7, 4.9 per cent., weight at 11 weeks 1.52, 1.64 lb., age at first egg 181, 191 days, adult mortality from housing to 50 days, 27, 18 per cent., broodiness 17, 55 per cent. broody and 0.33, 1.64 times broody, egg weight 58.0, 57.7 g., adult bodyweight (at 500 days) 4.43 (258 survivors), 4.64 (387 survivors) lb., survivors' 500-day production 131, 116 eggs, average group production 105, 103 eggs.

Further investigation on some of these findings is in progress.—P. C. Jowsey.

See also Absts. 4335, 4358, 4398, 4444, 4471, 4472, 4525, 4529, 4542, 5018.

EGG PRODUCTION

5548

O'NEIL, J. B. **Concentrate pellets and whole grain as a method of feeding laying hens.** *Canad.*

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J. Agric. Sci., 1954, 34, 131-136. [Dept. Poultry Husb., Univ. Saskatchewan, Saskatoon.]

In egg production, efficiency (lb. feed per dozen eggs laid) and general health, there was no difference between 4 groups of New Hampshire × Barred Plymouth Rock pullets of which group 1 received a commercial concentrate mash to appetite and whole grain twice daily; group 2 was fed like group 1 but was given the same amount of grain in one feed daily; group 3 had an all-mash ration in which the grain was ground and incorporated with the concentrate, and group 4 was fed to appetite with the concentrate in pellet form and mixed with the whole grains. In all groups the ratio of concentrate to grain was 1:7. Economic advantages claimed for the new method (group 4) are that the grain is not ground or hand-fed and the ration is easily mixed. The effect of the method on hatchability is being studied, and so far the results have been satisfactory.—T. D. Bell.

5549

SKALLER, F. **Studies on the assessment of egg production in poultry breeding investigations.** 1. The optimal period for recording first year egg production. 2. The correction of hatching date for early selection based on part-annual egg production records. *Poultry Sci.*, 1954, 33, 29-35; 316-321. [Poultry Res. Centre, Werribee, Victoria.]

1. The data come from a statistical examination of the first year laying records of a sample, stratified for hatching date, of 200 birds from a flock of 1375 White Leghorn pullets. Critical examination of the existing methods for measuring the number of eggs laid in the first year, namely, by biological pullet year, by biological calendar year and by the 500-day test, showed all to be significantly influenced by hatching date. A new interval, known as the standard pullet year, is substituted and is shown to be uninfluenced by date of hatching. The number of eggs laid by the bird is measured from the first one to 31 March in the following year (southern hemisphere seasons). It is suggested that a combination of the standard laying year and the 500-day test could be used to facilitate the investigation of problems of management.

2. The data presented in this paper come from a statistical examination of the records of a sample of 200 birds from a larger flock. (All dates and seasons apply to the southern hemisphere.) In order that the records of one year's laying could be used to select birds for breeding in the second year, it was found that records must be terminated at 31 May, since mating takes place soon afterwards for hatching in early July. As the hatching

season is spread over several weeks, 9 weeks for this particular flock, the production of different birds would be recorded for different times. The need for correction for this when annual part records are used is clear. The corrected egg number is given by the formula $E_{ij} (P_{ij} - N_{ij}) / P_{ij}$, where E_{ij} is the number of eggs from first egg to 31 May for the i th bird in the j th hatch, P_{ij} is the number of calendar days from first egg to 31 May and N is the mean deviation of net potential laying days from those of the median hatch. An example is shown in the text. The correlation coefficient between part-winter records and egg numbers per standard pullet year was improved from 0.308 to 0.494 by correcting the part-winter number of eggs as described.—M. J. Head.

5550

LILLIE, R. J. and SIZEMORE, J. R. **Effect of antibiotic on egg production of New Hampshires.** *Poultry Sci.*, 1954, **33**, 427-429. [Bur. Animal Indust., Agric. Res. Admin., U.S. Dept. Agric., Beltsville, Md.]

A flock of New Hampshire birds was housed intensively for the first 7 months of egg production and fed on an all-vegetable ration of soya bean meal 20, alfalfa meal 5, butyl fermentation solubles 0.5, mineral supplements 7.5, vitamin A and D feeding oil 0.3 and yellow maize meal to 100. The pullets were trap-nested, and at the end of this period 40 which had given less than 50 per cent. production were divided into 2 groups, of which one continued to receive the same ration, and the other a similar ration fortified with 1 per cent. of a supplement containing an unstated quantity of vitamin B₁₂, and an unstated quantity of an [unspecified] antibiotic. In the period from 1 to 6 months after the segregation the supplemented group gave 40 per cent., and the unsupplemented group 28 per cent. production.

Ninety-two pullets that had given more than 50 per cent. production in the first 6 months were divided into 4 groups which received, respectively, the original ration, the original supplemented with 1 per cent. of the supplement (as above), the original ration supplemented with 0.1 per cent. of a supplement containing an unstated quantity of vitamin B₁₂ but no antibiotic, and a commercial ration [composition not stated, but reported to contain some fishmeal]. Mean egg production in the 4 groups from 1 to 6 months after the re-grouping was 56, 50, 47 and 47 per cent., respectively.

It was concluded that incorporation of a supplement of vitamin B₁₂ and an antibiotic into a laying ration improved the egg production of low producers but not that of high producers.

K. J. Carpenter.

5551

MEHNER, A. Versuche über die Bedeutung des Auslaufes für die Geflügelhaltung. [Importance of runs in poultry keeping.] *Arch. Geflügelk.*, 1954, **18**, 123-140. [Hohenheim.] English summary.

Two series of laying trials were made with groups of 30 laying birds. In the first, 2 groups were confined to houses, one receiving 1 g. cod liver oil per bird daily, and the 2 other groups had free access each to 240 sq. m. of meadow. All birds received daily 50 g. of a mixture of equal parts of milo, maize and oats and free access to a mash. In the second trial there were 5 groups, 3 confined to houses and 2 with access to runs. All groups received grain as above and free access to a mash. Group 1 had a mash with adequate animal protein; group 2 this mash with half the fishmeal replaced by soya bean meal; group 3 was fed as group 2 but with one-third of the soya bean meal replaced by dried whalemeal; groups 4 and 5 received the same mash as group 2.

In the first trial there was no significant difference in the weight of eggs per bird between the groups, but in the second trial the relative weights were 100, 90, 84, 145 and 136 for the 5 groups. In both trials much less mash was eaten by the birds on grass. It is calculated that in a well covered run a bird finds daily 0.5 g. animal protein per sq. m. (cf. Abst. 3704, Vol. 11). The 2 trials taken together showed a favourable effect of free run on egg production, and incubator trials showed an improvement in hatching as compared with eggs from birds confined to houses.

Calculations based on saving in feed, increase in egg production, diminution in loss of birds and increased hatch showed that the total effect of the area usually available as range for a single bird, expressed in money value, was about equal to the feed costs for a single bird for 1 year in a house.

W. Godden.

5552

KAUFMAN, L., ŚWIAT-GANCARCZYKOWA, B. and BŁOŃSKA, J. Porównanie zdolności wykorzystania paszy na produkcję jaj u zielononózek i susseksów. [A comparative study on the utilisation of feed for egg production in Greenleg and Sussex pullets.] *Rocz. Nauk rol.*, 1954, **67**, 243-256. English summary.

5553

HAVERMANN, H. and WEGNER, R. M. (with BURGSDORFF-GARATH, A. v. and SCHLÜTTER, H.) Die Haltung von Legehennen in Batterien. [Keeping laying hens in batteries.] *Arch. Geflügelk.*, 1954, **18**, 107-123. [Inst. Tierzucht, Univ. Bonn.] English summary.

After a review of the literature on the results of trials with laying batteries in the United States

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and Britain, the results of a 10 months' test with a cafeteria-battery of British origin and one made in Germany are reported. They confirm that the advantages of such batteries in Britain hold equally for German conditions. The high cost of

the equipment and the relatively small market for table poultry are against the popularity of such batteries in Germany.—W. Godden.

See also Absts. 4500, 4526, 4527, 5007, 5538, 5546.

OTHER BIRDS

5554

DEMENT'EV, G. P., KARTESHEVA, N. N. and SOLDATOVA, A. N. Pitanie i prakticheskoe znachenie nekotorykh khishchnykh ptits v yugozapadnoi Turkmenii. [The nutrition and practical importance of certain predatory birds in South-west Turkmen.] *Zool. Zh.*, 1953, **32**, 361-375. [Biol. Pochven. Inst., Mosk. Gosud. Univ. Im. Lomonosov.]

Lists are given of the food of *Bubo bubo omissus*, *Athene noctua bactriana*, *Aquila chrysaetus fulva*, *A. rapax orientalis* and *Corvus corax ruficollis*. The results showed that all these birds are useful because they prey on rodents and harmful insects in south-west Turkmen. Their numbers, however, are small and measures should be taken to protect them so that they may multiply.—W. Hughes.

FOOD ECONOMICS AND STATISTICS

5555

PEUNKOV, S. I. Proizvodstvo kumysa v usloviyakh tabunnogo konevodstva uzbekistana. [The production of koumiss under conditions of range management in horse breeding in Uzbekistan.] *Konevodstvo*, 1953, No. 3, 37-38.

European labour force has increased steadily. The extent of mechanisation has also risen, especially the number of tractors, with a corresponding decrease in the use of equines. Fencing and fertilisers are the main necessities. The brief survey indicates the profound nature of the economic, technological and social changes being experienced in South Africa.

5556

FOX, F. W. The agricultural foundation of nutrition. 3. Natural limitations to the production of food. 4. Some other basic aspects of food production. 5. Maize. *S. African Med. J.*, 1954, **28**, 267-268; 361-363; 441-444. [S. African Inst. Med. Res., Johannesburg.]

For Parts 1 and 2 see Abst. 3594, Vol. 24.

3. South Africa is better adapted to pastoral than to arable farming but it is upon its arable farming that a country ultimately depends and the extension of arable farming is limited by topography, soil type and moisture supply. Of these lack of moisture is the most important, and the conclusion is that "the bulk of our food is grown in portions of an area that is about one-fifth of the Union". The occurrence of droughts and the high evaporation rates explain the smallness of the area under cultivation. The magnitude of the Union's long-term food problems should be constantly in mind.

4. These aspects concern production by European farmers only.

Farms have increased since 1930 from 97,000 to 119,000 in 1952, but average size has decreased from 1000 to 850 morgen (1 morgen = 2.116 acre). European farming population has decreased in the same period both in actual numbers and in proportion to the total population, but the non-

5. Production statistics show that between 1918 and 1952 maize crops rose from 16 to about 28 million bags per annum. European farmers grew much more than did African, but the fluctuations, which resulted in the main from climatic variations, were greater for European than for African production. Consumption over the same period increased from 9 to 16 million bags per annum; since 1940 there has been a great rise in the amount used to feed animals. The estimate of requirement for 1972, 38.5 million bags, raises the question of how it will be met.

Increases in African production are considered unlikely and the solution must be sought on European farms. With little additional suitable land available, and if the fertility of marginal land is to be maintained, the increase will have to be in yield per morgen. Between 1918 and 1952 there has been an increase but the national average of 5.4 bags per morgen is well below that of between 7.5 and 10.75 bags obtained by the more efficient growers. Use of hybrid maize would be of some help, but bettering of other conditions, e.g., improvement of soil structure and fertility, adequate control of weeds, pests, diseases and water evaporation are, on the basis of reports from Agricultural Research Stations, thought likely to be much more profitable. The close approach of demand to production makes the creation of reserve stocks,

and provision for their storage, matters of some importance.—D. Harvey.

5557

FAGE, L. Le plancton, source de nourriture. [Plankton as a source of food.] *Biol. méd.*, 1954, **43**, 129-138. [Inst. Océanographique.] A general article.

5558

BAUM, E. L., MEY, C. W., SHAW, A. O. and WALKUP, H. G. **Management practices and net returns in milk production in Washington.** *J. Dairy Sci.*, 1954, **37**, 14-21. [Dept. Agric. Econ., State Coll. Washington, Pullman.]

A sample of 244 individual 305-day lactation records out of a total of 28,968 was analysed according to week and month of calving. All cows had a grazing season of about 6 months. Having regard to milk prices in Western Washington during 1949-50 the most profitable months for calving were August and September and, in general, the least profitable March and April. Irrespective of date of calving the cost per cow or per gal. of milk was highest where it was the practice to use much grain with a fair amount of hay. Total costs for cows calving in the same month were influenced more by the amount of grain than by the amount of roughage given. It is concluded that the level of production per cow changes only the extent of the net returns and not the relation between the least and the most profitable month of calving.—W. Thomson.

5559

SHEPHERD, G., PURCELL, J. C. and MANDERSCHIED, L. V. **Economic analysis of trends in beef cattle and hog prices.** *Iowa Agric. Exp. Stat. Res. Bull.* No. 405, January 1954, pp. 726-743.

Since 1910 the ratio of cattle to pig prices at Chicago has increased at the rate of 1.2 per cent. yearly. The reasons given for these changes are: (1) there has been an increase in the percentage of urban consumers, who consume more than twice as much beef per head as country consumers, (2) occupations are less strenuous, so that there has been a decrease in consumption of carbohydrate foods and an increase in meat, (3) income has risen and become more evenly distributed and (4) competition between vegetable fats and lard has increased. It is estimated that these trends will continue at about the same rate, though over the next few years there may be a movement towards a closer price ratio as beef supplies increase from the larger herds built up while high prices rule. Beef prices will also continue to rise relative to disposable income as well as to pork prices, while, conversely, pork prices will continue to decline relative to income.—W. Thomson.

5560

JAWETZ, M. B. **The combined effect of levels of stocking and yields per cow upon farm profits on dairy farms.** Dept. Agric. Econ., Univ. Coll. Wales, Aberystwyth, December 1953, pp. 27.

The records of 98 Welsh farms during 1951-52 were used to study the effect on profit of density of stocking with dairy cows, yield per cow and density of stocking with followers. The farms were considered as below or above average in each respect, giving 8 combinations. Allowance was made for subsidiary enterprises such as pigs and poultry in assessing the profit per acre.

Profit depended in the first place on a high rate of stocking with cows. High yields were next in importance, and these were complementary. Too heavy a rate of followers in relation to milking stock reduced profits. The possible effects of changes in the price of feedingstuffs and milk are discussed.—T. D. Bell.

5561

STRUTT, C. W. **Australian beef. 1. Production and marketing.** *Agriculture, J. Minist. Agric. Engl.*, 1954, **61**, 73-76. [Office of the High Commissioner for the United Kingdom, Canberra.]

The difficulties of beef production in Australia are discussed. Climate excludes a large part of the country from any extensive production. The other major difficulty is transport: in many areas rail and mechanised road transport are not available, and droving is slow, costly and risky when water is not available.

Production has increased by 12 per cent. since 1939, and where the construction of road or railway is impracticable air transport may be possible and has already been tried on a small scale. An investigation of the economics of air transport and its extension are discussed.

T. D. Bell.

5562

SHARP, L. P. and SULLIVAN, W. **Reducing costs of raising dairy heifer replacements.** *California Agric. Exp. Stat. Circular* No. 435, March 1954, pp. 11.

5563

BYERLY, T. C., ELLIS, N. R., HANKINS, O. G., HOWE, P. E., HODGSON, R. E. and WHITTIER, E. O. **Nuevos resultados en la industria agropecuaria y en el uso, tratamiento y conservación de los productos animales. [Recent results in the cattle industry and in the use, processing and preservation of animal products.]** *Proc. IV Conf. Interamericana Agric.*, 1950, 93-102. [U.S. Dept. Agric.]

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5564

JANICKI, M. A. Ocena wartości przetwórczej trzody chlewnej. [**Determination of industrial value of pigs.**] *Rocz. Nauk rol.*, 1954, **67**, 193-242. [Inst. Zootech., Bydgoszcz.] English summary.

5565

GRANT, A. **Hill farming in the North of Scotland.** *North of Scotland Coll. Agric., Agric. Econ. Dept. Econ. Rep. No. 38*, February 1954, pp. 21.

The 37 farms studied all had more than 50 per cent. of their land classified as rough grazing and permanent pasture. Twenty were termed upland rearing farms, with acreage ranging from 250 to over 1250. All except one carried a ewe flock and most had some breeding cows, though their relative importance varied considerably; pigs and poultry varied in importance. The number of lambs surviving per 100 ewes at opening valuation was 110, range 85 to 140, for farms under 1000 acres and 95, range 70 to 121, for those over 1000 acres. For these 2 sizes of farms the average net surplus per £100 rent, excluding management charge, was respectively £268 and £392 in 1952-53 compared with a loss of £157 and a surplus of £249 in 1951-52. The 1952-53 surplus was equal to 6½ per cent. interest on capital for the smaller and 9 per cent. for the larger farms. It is pointed out that, but for subsidies, the smaller farms in par-

ticular would have again showed a net loss. The other 17 farms were classified as hill sheep farms, with an acreage ranging from 888 to 14,162, of which 99 per cent. was termed rough grazings. Ewe flocks varied from under 250 to 1374 and 9 farms carried from 4 to 27 cows. The average number of lambs sold or retained per 100 ewes at weaning was 77, range 54 to 105. The net surplus was £87 per 100 ewes or 11½ per cent. interest on capital. On farms where sheep were the only stock there was no direct subsidy.—W. Thomson.

5566

BREIERM, K. Husdyrbrukets plass i norsk landbruk. [**The place of animal husbandry in Norwegian agriculture.**] *Landbrukshøgsk. Inst. Husdyrernæring Foringslære*, Repr. No. 128, 1953, pp. 11.

Three-quarters of farm land in Norway is under grass. Agricultural policy is discussed in relation to that fact and to the recommendations of FAO and experiences elsewhere. Of the gross earnings of agriculture in Norway in 1951-52, 78.7 per cent. came from animal husbandry and 41.6 per cent. from milk. It is argued that it is sound policy to continue to regard milk as the most important and most economical product, to improve milk production by improving stock and to increase as far as possible the use of home-produced feeding-stuffs.—I. Leitch.

DIET IN ETIOLOGY OF DISEASE

GENERAL

5567

SCARISBRICK, R. **Acid indigestion in a sheep fed on mangolds.** *Vet. Rec.*, 1954, **66**, 131-132. [Dept. Animal Pathol., Univ. Cambridge.]

A Suffolk wether of bodyweight about 150 lb., fitted with a rumen cannula, was offered 16 lb. instead of its usual 12 lb. of mangolds daily. It ate only 15 lb. and next morning was found to be distressed and acutely lame in all 4 feet, which were hot to the touch. It recovered spontaneously within a few days.

During this illness, there was at first the normal increase in rumen volatile fatty acids and ammonia, but then the ammonia level continued to rise unusually high and the fatty acid level fell away before attaining its usual normal value; it subsequently became very low. Lactic acid concentration was very high indeed. Rumen pH was 4.7. During recovery the picture gradually returned to normal.

It was considered that the normal mechanisms for absorption and neutralisation of acid must have been put out of action, but it was not possible

to reproduce the syndrome in other sheep by feeding them on mangolds. However, signs of ruminal stagnation have followed the administration of dilute mineral acid when the rumen pH has fallen below 5. A similar condition followed the administration of 500 g. glucose.

It was concluded that the rapid production in the rumen of an amount of acid of the order of 1 g. equiv. may overwhelm the neutralising capacity immediately available, and that the resulting acidity interferes with those neutralising mechanisms that act more slowly. The slower production of considerably more acid can be tolerated without difficulty.—W. A. Greig.

5568

LINDAHL, I. L., COOK, A. C., DAVIS, R. E. and MACLAY, W. D. **Preliminary investigations on the role of alfalfa saponin in ruminant bloat.** *Science*, 1954, **119**, 157-158. [Animal and Poultry Husb. Res., Agric. Res. Centre, Beltsville, Md.]

Saponins were recovered from alfalfa by a method outlined.

Before the animal tests began, the experimental ruminants were subjected to preliminary tests for susceptibility to bloat by pasturing on alfalfa or ladino clover for several days and then drenching with ladino clover or alfalfa juice. Saponin was then administered, dissolved in 1 to 2 pints of water, by stomach tube.

In 5 sheep and 1 goat receiving 15 to 25 g. saponin, distension of the rumen was light moderate to moderate; in 1 sheep receiving 55 g. it was moderate to severe; and in a heifer given 75 g. it was light moderate. In general, peak distension occurred after 30 to 45 min. compared with 10 to 15 min. after drenching with juice.

Several attempts to produce bloat in sheep on grass pasture by giving alfalfa or ladino juice all failed; but when one such sheep was given 15 g. saponin slight distension resulted. The same animal given 25 g. saponin after grazing a ladino pasture developed distinct distension. A mature goat given 15 g. saponin did not become distended, but was also relatively resistant to ladino juice. In all cases distension appeared to be due to gas rather than froth.

No detectable reaction was given by 2 commercial saponin solutions, nor by 25 g. of a household detergent.—W. A. Greig.

5569

SMITH, C. K., BRUNNER, J. R., HUFFMAN, C. F. and DUNCAN, C. W. **Experimental production of frothy bloat in cattle.** *J. Animal Sci.*, 1953, 12, 932. *Proc.* [Michigan State Coll.]

5570

SCHOFIELD, F. W. **The prevention and treatment of white muscle disease (muscular dystrophy).** *Canad. J. Comp. Med.*, 1953, 17, 422-424. [Dept. Pathol., Ontario Vet. Coll., Guelph.]

5571

LINDLEY, C. E., TAYSOM, E. D., HAM, W. E. and SCHNEIDER, B. H. **Urinary calculi in sheep.** *J. Animal Sci.*, 1953, 12, 704-714. [Washington Agric. Exp. Stat.]

Nine groups of 6 ram lambs were used to find the effects of high intake of CaCO_3 , MgCO_3 and K_2HPO_4 on the formation of urinary calculi. The data indicate that P was the cause of the highest incidence of calculi. Deficiency of carotene or vitamin A in the diet was not involved. Water intake and rate of urine excretion were higher in groups with higher incidence of calculi. Data on blood and urine analysis are presented.—J. C. Gill.

5572

LEOSCHKE, W. L. and ELVEHJEM, C. A. **Prevention of urinary calculi formation in mink by**

alteration of urinary pH. *Proc. Soc. Exp. Biol. Med.*, 1954, 85, 42-44. [Dept. Biochem., Coll. Agric., Univ. Wisconsin, Madison.]

Chemical analyses of mink calculi had shown that the main component was $\text{MgNH}_4\text{PO}_4 \cdot 6\text{H}_2\text{O}$. Tests *in vitro* showed that although this salt is soluble in water at pH 6 or less, solubility drops rapidly between pH 6 and 7.5.

The addition to the normal ranch diet of 1 g. NH_4Cl per mink daily reduced urine pH from an average of 6.4 (range 5.5 to 7.5) to 5.7 (range 5.5 to 5.9).

A group of pregnant mink were then given this supplement from 22 April to 22 May, i.e., the period when urinary calculi most frequently form in this class of animal. Only 1 of 200 mink fed in this way died from urinary calculi; 16 of 400 control animals were lost from this cause. In a later field trial on commercial ranches, NH_4Cl was given from 10 April to 1 June. A total of 40,000 mink each received 0.5 g. NH_4Cl daily, and losses varied from 0.5 to 3 per cent.; but in 10,000 mink receiving double this quantity losses were less than 0.2 per cent.

It was concluded that 1 g., but not 0.5 g., NH_4Cl per animal daily will prevent urinary calculi in breeding female mink.—W. A. Greig.

5573

WITZKE, O. **Indikationsgebiete für Aminosäurenpräparate in der Veterinärmedizin unter besonderer Berücksichtigung von Tetrhomin und Keratyp.** [Indications for the use of amino-acid preparations in veterinary medicine, with special reference to Tetrhomin and Keratyp.] *Berl. Münch. tierärztl. Wochenschr.*, 1954, 67, 93-95. [Berlin.]

Keratyp is a preparation suitable for injection containing 9 per cent. of total amino-acids, of which 1.5 per cent. is cystine-cysteine, 1.5 per cent. methionine, 0.5 per cent. glutamic acid and 0.3 per cent. tyrosine, the remaining 5.2 per cent. being a mixture of 9 other amino-acids. Tetrhomin is a combination of the above with thiocyanic acid. This latter preparation is recommended for use in infectious disease, including puerperal fever. Keratyp is recommended for acetonuria and acute liver disease, puerperal haemoglobinuria, hypocalcaemia and tetany, along with calcium treatment in the 2 latter. It is of use also after operations.—W. Godden.

5574

RINDFLEISCH-SEYFARTH, M. **Muskelmagenleiden bei Haushühnern infolge diverser Futter-schäden.** [Crop disorders in domestic poultry as the result of faulty feeding.] *Berl. Münch.*

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tierärztl. Wochenschr., 1954, **67**, 142-143. [Vet. Untersuchungsanst., Hamburg.]

A brief review.

See also Absts. 4372, 4531, 5254.

DEFICIENCY DISEASES

5575

PAVLOV, A. A. Klinitzeskie proyavleniya mineral'nogo golodaniya u sel'skokhozyaistvennykh travoyadnykh zhivotnykh. [**Clinical manifestation of mineral deficiency in herbivorous farm animals.**] *Veterinariya*, 1953, **30**, No. 7, 39-40.

The importance of dietary salts in correct proportions is emphasised by observations of deficiency in cattle and horses in a number of localities, particularly in Kazakhstan and Kirgizia, although the content of salts in the soil in these regions is very high. The disorders, including rickets, osteomalacia and pathological fractures, are obviated by adding bonemeal or commercial phosphate preparations to the diet. Deficiency is commoner towards the end of the period spent in stall, and is thought to be due to deficiency of vitamins concerned in the assimilation of Ca and P.

D. W. Taylor.

5576

KRÜGER, W. Ist die Rinderleukose eine Mineralstoffmangelkrankheit? [**Is leucosis in cattle a mineral deficiency disease?**] *Berl. Münch. tierärztl. Wochenschr.*, 1954, **67**, 149-153. [Inst. Milhyg., Bundes-Versuchsanst. Milchwirtsch., Kiel.] English summary.

The possibility that mineral deficiency may have something to do with leucosis in cattle is discussed. In Germany the disease is confined to the North German plain, which was subject to glaciation, so that many of the soils are poor in minerals. Recent results by Wehrmann (*Dissertation*, Kiel, 1953) on the manganese, copper and cobalt contents of Schleswig-Holstein pastures are quoted; pastures on podsols and low moor are liable to be deficient in Cu and Co. But leucosis occurs on other soils and, on the other hand, is relatively uncommon in a "Lecksucht" (pica) region just south of the Danish border.

An outbreak in a dairy herd on an experimental farm of the *Institut für Milchhygiene* coincided with a period when the pasture had not been receiving its usual treatment with fertilisers containing Cu and Co and owing to the war the protein: starch ratio of the indoor ration had been narrowed by the use of distiller's spent wash from milo (sorghum) offal, with rapeseed cake and home-grown hay. The disease attacked cows only, not calves, and only those with yields above average. With a return to normal conditions the number of cases gradually decreased. Nevertheless in 1950

an experiment, which still continues, was begun in which half the cows were given 2 or 3 table-spoonfuls daily during the stall-feeding period of a mineral supplement (supplied by the firm Bayer, Leverkusen) containing Ca, P, Mg and the trace elements Cu, Mn, Zn, Co, Fe, I and B. The others were given a commercial mineral mixture. Of the 3 cows and 2 heifers subsequently found to have leucosis, none had had the Bayer mixture. The numbers are too small for firm conclusions to be drawn and further investigation will be necessary to find out which, if any, of the constituents of the Bayer mixture is effective.—W. M. Deans.

5577

CUNNINGHAM, I. J. **Copper deficiency in cattle and sheep.** *N.Z. J. Agric.*, 1954, **88**, 369-374. [Dept. Agric. Animal Res. Stat., Wallaceville.]

5578

NIKONOV. Solevoe golodanie telyat. [**Salt deficiency in calves.**] *Veterinariya*, 1953, **30**, No. 5, 45.

The pasturing of a dairy herd on certain meadows in autumn, and feeding in winter on hay from the same meadows, was followed by the appearance of peculiar signs in the newborn calves. The hay had little chloride and no sodium. Salt was not added to the ration. The animals exhibited apathy, painful diarrhoea and pinkish spots round the nostrils, and refused to take milk. Death ensued in 3 to 5 days. Principal findings at post mortem were punctate haemorrhages in the gastric and intestinal mucosa and sometimes in the endocardium and under the renal capsules. The bacterial flora was normal. The condition responded only, but completely, to the administration of 1 per cent. NaCl solution.—D. W. Taylor.

5579

GRATER, G. S., OSBORNE, A. D. and WHITE, J. B. **Sudden death of cattle attributed to peracute hypomagnesaemia.** *Vet. Rec.*, 1954, **66**, 161-162. [Salisbury.]

An Ayrshire herd was transferred on 24 June from a farm on heavy clay soil to one on light chalk soil and turned on to a permanent pasture containing a moderate admixture of clover. Within 10 days 3 cows, all of which had calved less than 2 months earlier, died suddenly without showing signs of illness. At post-mortem examination all were found to have enlarged spleens which had ruptured with extensive haemorrhage. One animal also had acute congestion of the abomasum, and another exhibited haemorrhages into the muscular portion of the diaphragm, the peritoneal and mucous surfaces of the abdominal alimentary viscera, and the endocardium; its chest cavity contained between 1 and 2 gal. blood.

Extensive investigations revealed no evidence of infection or poisoning. Two of 6 surviving cows examined had serum Mg levels below 2 mg. per cent.; they had been maintained under the same conditions but were at a more advanced stage of lactation. On this evidence, peracute deficiency of magnesium was diagnosed.

Unusual features of the outbreak included the extremely rapid onset and course of the condition, the absence of any history of typical cases on the farm, and the consistent finding of rupture of the spleen.—W. A. Greig.

5580

BALLOT, H. Un trouble du métabolisme de nature carentielle. Dégénérescence graisseuse du foie chez l'agneau. [Metabolic disturbance of the nature of a deficiency. Fatty degeneration of the liver in lambs.] *Bull. Acad. vét. France*, 1953, **26**, 583-587.

In a flock of sheep of the Île de France breed, 30 lambs died of a wasting disease at the age of 6 months. At post mortem the livers were greatly enlarged, pale in colour and infiltrated with fat. The protein content of the diet had been reduced when the wasting disease first appeared. As treatment the protein content was increased again, and each lamb was given 2 injections of 75 mg. methionine 4 days apart. Two very sick lambs died, but the others recovered rapidly.

E. M. Hume.

See also Absts. 4336, 4337, 4339, 4340, 4346, 4361, 4370, 4371, 4491, 4492, 4504, 4515, 4535, 4536, 4877.

DISEASES OF METABOLISM

5581

BODA, J. M. and COLE, H. H. The influence of dietary calcium and phosphorus on the incidence of milk fever in dairy cattle. *J. Dairy Sci.*, 1954, **37**, 360-372. [Div. Animal Husb., Univ. California, Davis.]

Purebred Jersey cows which had calved at least 3 times were selected from a herd with a high incidence of milk fever and were divided into 4 groups. Group 1, 14 cows, received alfalfa hay to appetite during the whole dry period of 2 to 3 months; the Ca:P ratio of the hay was 6:1. Group 2, 16 cows, received for from 9 to 73 days before calving a low-Ca, high-P diet of oat hay and ground barley, with monosodium phosphate; the Ca:P ratio was 1:3.3. Group 3, 20 cows, received for from 5 to 45 days a diet also composed of oat hay and ground barley, with spent bone black; Ca:P ratio 1:1. Group 4, 19 cows, received the same ration as group 3, but with CaCO₃ instead of bone black; the Ca:P ratio was 5.9:1, but the Ca and P intakes were higher than on alfalfa hay. After calving, blood samples were

taken and all the cows received the usual ration of the herd.

In the 4 groups the incidence of milk fever was 5, none, 3 and 5, respectively. Four of 8 cows which did not develop milk fever on the low-Ca, high-P diet developed milk fever in the next lactation when they received a high-Ca diet before calving.

It is suggested that a low Ca, high P diet before parturition is an effective preventive of milk fever, and that this is due to stimulation of parathyroid activity as a response to the low Ca intake.

D. Duncan.

5582

ROBERTS, S. J. Ketosis—parturient paresis complex. *J. Amer. Vet. Med. Assoc.*, 1954, **124**, 368-372. [Dept. Med., Obstet. and Ambulatory Clin., New York State Vet. Coll., Ithaca.]

POISONS OCCURRING IN FOOD

5583

PICKUP, J., WORDEN, A. N., BUNYAN, J. and WOOD, E. C. Chronic constipation in dairy cattle associated with a high level of zinc in the water supply. *Vet. Rec.*, 1954, **66**, 93-94.

Chronic constipation developed in a pedigree Jersey herd in early winter, and, despite treatment, persisted until April when stall-feeding ceased. All classes of animals were affected, including the stock bull and young calves. In lactating animals, milk yield fell.

The same trouble recurred the following winter in a milder form, and its cause was traced to the water supply, which proved to contain up to 8 p.p.m. Zn. Presumably Zn had been released from the galvanised coating of the storage tanks as a result of electrolytic reaction with the copper pipes supplying the cowshed. Deposits found in the water bowls were shown to consist of CaCO₃ with traces of Mg and Zn, from which it was concluded that the water supply had contained appreciable quantities of Zn for some time past.

The storage tanks were cleaned and treated with bitumastic paint, after which no further trouble was experienced.—W. A. Greig.

5584

CAMPBELL, J. B., DAVIS, A. N. and MYHR, P. J. Methaemoglobinaemia of livestock caused by high nitrate contents of well water. *Canad. J. Comp. Med.*, 1954, **18**, 93-101. [Exp. Farms Serv., Swift Current, Sask.]

5585

COPENHAVER, J. S. and BELL, W. B. The production of bovine hyperkeratosis (X disease) with an experimentally made pellet feed. *Vet.*

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Med., 1954, **49**, 96-101; 106. [Dept. Animal Husb., Virginia Agric. Exp. Stat., Blacksburg.]

Pelleted feed was prepared in 4 lots of one ton each in a pellet mill. For the preparation of lots A and B the lubricant for the rolls of the mill contained no highly chlorinated naphthalene, while that for lots C and D did. For lots A and C the rolls were lubricated only once, before the pelleting process began; for lots B and D the lubricant was introduced in small quantities at 10-min. intervals.

The 4 lots of pellets were subsequently given each to 2 calves, feeding the pellets within each lot given in the order in which they were made. Calves on lots A and B all remained in every way normal, but those on lots C and D had poor appetites, made poor weight gains and had low blood vitamin A levels; all developed typical signs of bovine hyperkeratosis and at autopsy displayed typical lesions, of which full details are given. The calves on lot C were most affected, one dying after 41 days and the other being killed when moribund after 82 days.

Two calves were given the lubricant containing chlorinated naphthalenes by mouth and developed hyperkeratosis; 2 calves given the other lubricant remained healthy.

Two further calves were given lot C pellets, one from the place where the first 2 calves left off (only about 9 per cent. of the lot had been consumed) and the other starting with the last bag and moving backwards. The first calf developed severe hyperkeratosis but the second became only very mildly ill, indicating that the toxic substance in the lubricant had been concentrated in the first portion of the lot.—W. A. Greig.

5586

PRIBIĆEVIĆ, S. and ŠEVKOVIĆ, N. [A contribution to the experimental study of cockle-bur (*Xanthium saccharatum*) poisoning.] *Acta vet., Belgrade*, 1954, **4**, 58-64. [Inst. Animal Nutrit.] English summary.

Cockle-bur given to pigs at the rate of 1.5 per cent. of liveweight or more killed them in 10 to 15 hr. When the plant was introduced gradually at lower levels tolerance developed and that amount could be exceeded without ill effect. An aqueous extract at 1.1 to 1.3 per cent. of liveweight, given subcutaneously, was fatal to rats and mice. The active principle was thought to be a glucoside. Post-mortem appearances showed gastro-enteritis, liver, spleen and kidney degeneration, and haemorrhage. (From summary.)—J. S. Thomson.

5587

SIMS, F. H. and CROOKSHANK, H. R. Serum values in "wheat pasture poisoning" cases.

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J. Animal Sci., 1953, **12**, 954-955. *Proc. [Texas Agric. Exp. Stat.]*

5588

STEHLE, H. Nota sobre los vegetales tóxicos para el ganado y las malezas de los pastoreos en la zona del Caribe. [Note on plants poisonous to cattle and diseases occurring on pasture in the Caribbean area.] *Proc. IV Conf. Inter-americana Agric.*, 1950, 541-544. [Antillas.]

See also Absts. 4232, 5048.

IMMUNITY

5589

GIBSON, T. E. Studies on trichostrongylosis. 1. The pathogenesis of *Trichostrongylus axei* in sheep maintained on a low plane of nutrition. *J. Comp. Pathol.*, 1954, **64**, 127-140. [Vet. Lab., Minist. Agric. Fish., Weybridge.]

Egg counts, weights and haematological observations are presented graphically for 6 lambs fed on a diet of hay only and artificially infected with *Trichostrongylus axei*. Three lambs which died showed loss of weight, severe oligocythaemia, and a tendency to neutrophilia just before death. The blood picture was normal in the other 3 lambs.

G. C. Hunter.

5590

SPEDDING, C. R. W. Pasture management to control worms in sheep. *Agriculture, J. Minist. Agric. Engl.*, 1954, **61**, 51-54. [Grassland Res. Stat., Stratford on Avon.]

Helminth infestation was prevented in lambs by strip grazing on new pasture. The lambs were moved to a fresh strip every 2 days and did not return to the old strips. It was 11 months since any animal had been on the ground, when it was grazed as stubble. The ley was sown as a direct seeding following an oat crop. This treatment appeared to be sufficient to produce a clean pasture. Further observations on ewes and their lambs suggest that strip grazing on clean pasture reduces helminth infestation to negligible amounts.

G. C. Hunter.

5591

SPEDDING, C. R. W. The effect of a sub-clinical worm-burden on the liveweight gain of lambs. *Empire J. Exp. Agric.*, 1953, **21**, 255-261. [Grassland Res. Stat., Stratford on Avon.]

Lambs artificially infected with *Trichostrongylus axei* did not gain as much weight as their uninfected twins over a 10-week period.—G. C. Hunter.

5592

SPEDDING, C. R. W. The persistence of the effects of worm infestation in sheep. *Empire J. Exp. Agric.*, 1954, **22**, 55-58. [Grassland Res. Stat., Stratford on Avon.]

5593

RIEDEL, B. B. **Tryptophane and its relationship to ascarid infections in New Hampshire chicks.** *Poultry Sci.*, 1954, **33**, 80-84. [Dept. Animal Dis., Mississippi Exp. Stat., State College.]

New Hampshire chicks on a high-tryptophan diet put on weight more rapidly than similar

chicks on a low-tryptophan diet. The additional tryptophan did not influence the birds' susceptibility to *Ascaridia galli*, and the infected birds grew as well as the uninfected controls on both diets.—G. C. Hunter.

See also Absts. 4461, 4528.

7. BOOK REVIEWS

5594

PLANT, M. **The domestic life of Scotland in the eighteenth century.** University Press, Edinburgh, 1952, pp. xi + 319.

This interesting picture of family life in Scotland in the eighteenth century is painted largely from information obtained from the household accounts of Lady Grisell Baillie, Sir John Foulis and others of the nobility and from the written impressions of travellers from England and the Continent. It is not surprising, therefore, that one sees fairly clearly how the laird lived but not so clearly how his tenants lived. Despite this disadvantage, the book should find favour as an informative, well documented, and sometimes amusing account of the times.

The chapters entitled "The kitchen and the cook" and "Food and drink" suggest that the Scottish laird entertained his guests in much the same lavish fashion as did his English counterpart, although it is suggested that more simple food sufficed when the visitors had gone. Plain fare in Scotland was based largely on oatmeal, which appeared as pottage, brose, bannocks, kale, or sowans, according to the time of day. Salt beef, cabbage, fish in many districts, milk, and potatoes in the second half of the century, supplemented the oatmeal dishes. Bread was little used and Adam Smith is reported to have attributed the poor health of Scots compared with English to the Scottish diet of oatmeal. The chapter in this book on "Health and sanitation" indicates that the causes of Scotland's higher rates of sickness and mortality were more probably overcrowding and poor sanitation than diet.—F. C. Aitken.

5595

BOGERT, L. J. **Nutrition and physical fitness.** W. B. Saunders Company, Philadelphia, 1954, 6th ed., pp. xiv + 664. Price 22s. 6d.

The study of nutrition is a scientific discipline, but nutrition is not a scientific entity: it is a meeting place of such sciences as chemistry, physics and biology.

This edition of a well-established text has been largely re-written, so that it is rather surprising to find that the author still adheres to his original purpose to make nutrition "understandable to

those without previous knowledge of Chemistry" And there is no reference to a need for a previous knowledge of biology: all the book supplies is a meagre section on "Body Processes" well on in the text and occupying less than 100 out of 600 odd pages.

This is not indeed a bad book: it deals at considerable length with the nature of foodstuffs, says a little about alimentation, metabolism, excretion and endocrinology, and then goes on to the planning of meals and the principles of dietetics. Each chapter, too, has a useful bibliography. Moreover, quite copious references are given at the foot of many of the pages. In short, this book is quite a considerable text in nutrition but certainly not fully comprehensible to those without some knowledge of chemistry and of biology. There is no short cut to a proper understanding of nutrition.

R. C. Garry.

5596

DØSSING, J. **Determination of individual normal weights of school children.** Publ. No. 28 from Univ. Inst. Human Genetics, Copenhagen 1952, pp. 105. Ejnar Munksgaard, Copenhagen.

This thesis starts with a historical review of publications dealing with weights and heights of children, and goes on to detail the different methods proposed for judging the normality or otherwise of individual weight measurements, including various indices, charts, regressions on other body measurements, and tables. These methods all have the same defect, that they depend on average values and measures of dispersion found from measurements of numbers of children, while each child is believed to have his own individual normal weight, and it is the deviation from this value that is important, rather than that from an average value.

An analysis is described of weight and height data for 8786 boys and 8673 girls from elementary and secondary schools in Copenhagen, excluding children with chronically inhibited growth. For each child at least 6 pairs of measurements were available from routine annual examinations, with heights in the range 120 to 180 cm. and age range about 7 to about 18 years. Over this range it is found that average weight is related to average height by a relation of the form $w = ch^m$, so that

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if average results are plotted on double logarithmic scales a linear relationship is shown. Measurements for individuals may also be plotted in this way and the best straight line through the points may be taken to define the characteristic weight of the child for each height attained. The mean variabilities of the measurements from these individual lines, measured by standard deviations, have been calculated for boys and for girls. They are found to be independent of height, and to be considerably smaller than the variabilities about average weight. The distribution of the slopes, and of the levels of the lines for a fixed height, is found to be approximately normal, indicating that there is a continuous transition from a slender to a stocky type of body build.

Charts have been designed to facilitate the assessment of weight measurements and growth. A separate chart is kept for each child, weight being plotted against height on double logarithmic paper. After several measurements have been made it is possible to estimate the level and slope of the growth line. Long-term conclusions may be drawn from the relation of the level and slope to average values, short-term conclusions from the deviations of further individual points from the line in terms of the standard deviation.

A number of examples are given of the use of the charts, with details of the case history of the child in each case.

In conclusion, a statistical section gives methods of calculation and details of the construction of the charts.—I. McDonald.

5597

COSTA, D. *Calcio, leite e alimentação humana. [Calcium, milk and human diet.]* SAPS, Rio de Janeiro, 1953, pp. 102. English summary.

This attractively covered and well printed book, which is little more than a pamphlet, has been prepared, presumably for use in popular education, for SAPS, Serviço de alimentação da Previdência Social. Professor Costa commences on the grand scale with a general review of human nutrition, and especially of its sociological implications, and ends with a description of a single experiment on the availability of calcium in milk for rats.

Chapter 1 is a "Panorama of the problems of human nutrition". It surveys the role of diet in the growth, health and character of individuals and races and touches on the much discussed question of the growing world population. The development of the science of nutrition is important but the part played by instinct in the choice of food should not be neglected. The science which denied the importance of instinct "would be a dead science, turned against life itself."

In chapters 2 and 3 we come from the general

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to the particular, with a review of the roles played by calcium in the body and an estimate of requirements. Requirements of Brazilians are considered to be less at all ages than those suggested in the literature for the United States and Britain.

Chapter 4 returns to world food problems with reference to regional differences in the composition of foods and of the diet as a whole. The dependence of man on the soil on which he lives is brought into discussion before the narrower theme of sources of calcium in the Brazilian diet.

Conditions which affect the utilisation of calcium are discussed in chapter 5. Foods must be judged not only on the quantity of calcium they contain, but also on its availability, which may depend upon many other constituents of the diet, such as fats, oxalates, roughage and substances which affect the pH of the intestinal tract. A few plants, such as lettuce and watercress, are rated as sources of calcium as highly as milk in respect of availability. The quantities supplied would, of course, be relatively minute.

The last chapter is devoted to an experiment which showed that 87 per cent. of the calcium in dried skimmed milk was utilised by growing rats. Half a litre of milk daily is enough to cover 58 per cent. of the calcium requirement of the Brazilian adult, assuming that utilisation is comparable in adult men and in growing rats, a dangerous assumption, surely.

The book is clearly printed and has a brief summary in English. There are errors in Table 4, on the calcium requirements of children aged 4 to 6 and 7 to 9 years.—D. Duncan.

5598

PATWARDHAN, V. N. and RANGANATHAN, S. *The nutritive value of Indian foods and the planning of satisfactory diets.* *Health Bull.* No. 23, 4th ed., 1951, pp. ii + 79. [Nutrit. Res. Labs., Indian Res. Fund Assoc., Coonoor.]

Health Bulletin No. 23 appeared first in 1937 bearing the name of the then Director of the Nutrition Research Laboratories at Coonoor, Dr. Aykroyd. Now in its fourth and fully revised edition by the present Director and Chief Chemist, Drs. Patwardhan and Ranganathan, it has continued successfully to fulfil two demands, the one for an elementary textbook on nutrition for Indians and the other for a compilation of data on the composition of foods suitable for use by those particularly responsible for the feeding of groups of the population in the Indian sub-continent and the Far Eastern archipelagos. The value of these tabulated data has been enhanced by the inclusion of new tables which give the common English name, the botanical name and their equivalents in 9 of the more important languages spoken in these parts.—D. Harvey.

5599

JOHNSTON, J. A. **Nutritional studies in adolescent girls and their relation to tuberculosis.** Charles C. Thomas, Springfield, Illinois, 1953, pp. xi + 320. Price 55s.

The main purpose of this study was an attempt to correlate nutritional state, as measured by retention of N and Ca, with the course of tuberculosis in adolescent girls. About two-thirds of the book is devoted to case reports of long-term Ca and N balance studies in 26 girls. Data are given also of B.M.R. measured at intervals of 6 days throughout the studies. Clinical notes and X-ray photographs indicate the course of the disease.

The study was begun during a 20-year X-ray study of 932 child reactors to tuberculin removed from their sources of infection, when it was found that of 29 who showed endogenous re-infection 21 were girls and of these 12 developed the infection within the period covered by the 2 years preceding and 3 years succeeding the first menstrual period. The 26 subjects of the nutritional study included 9 of those listed as cases of re-infection.

As a background to the main study data are tabulated of Ca and N balances and B.M.R. in a group of 8 healthy control girls and observations on other 3 are reported in detail. Small groups or single subjects were used in studies of the effects of thyroid, sex hormone, adrenal hormone, or chronic focal infection, such as infected tonsils, on Ca and N metabolism and for studies of the amounts of Ca and vitamin D required in adolescence and the effect of cevitamic acid on Ca metabolism. The effect of exercise on Ca and N metabolism was studied in a small group of children with tuberculosis.

In the main study there appeared to be a positive correlation between adequate storage of N and a favourable course of the infection. Storage of Ca seemed to be of importance in the preservation of the integrity of the primary lesion but not in the healing of the re-infection. A diet providing an energy intake of basal plus 70 per cent. with 15 per cent. of calories from protein was adequate for good storage of N in most subjects. In some, amino-acids or powdered milk were useful to increase N intake. Supplements of dicalcium phosphate and/or vitamin D were given to some with inadequate Ca storage.

The background studies indicated that in adolescence there is a prepubertal period of accelerated growth, high B.M.R. and increased capacity for N and Ca retention, and a post-pubertal period of deceleration in rate of growth, low B.M.R. and diminished ability to retain N and Ca. Hypo- and hyperthyroid states were accompanied by diminished storage of N and Ca. Administration of thyroid in hypothyroidism increased retentions. Oestrogens diminished retention of N and Ca in

girls and testosterone increased N and decreased Ca retention in boys. Focal infection, e.g., infected tonsils, depressed N retention. In tuberculosis patients allowed moderate exercise N and Ca retention improved. The Ca requirement of the adolescent girl appeared to be 1.3 to 1.5 g. daily and 1000 I.U. vitamin D was considered to be necessary. The results of a study of the effect of cevitamic acid on Ca retention were inconstant.

The findings are discussed in relation to the management of tuberculosis in adolescents, and it is concluded that the most important contribution that can be made to the prevention of endogenous re-infection in the tuberculin reactor is the ensuring of normal retentions of N and Ca; this involves the provision of an adequate intake and a thorough consideration of all conditions influencing utilisation.—F. C. Aitken.

5600

SELYE, H. and HORAVA, A. **Third annual report on stress.** Acta, Inc., Montreal, 1953, pp. 637. Price 80s. net.

The reviewer is not ashamed to admit, with Belloc, that :

"The argument is much too wide
And much too deep and much too hollow,
And learned men on either side
Use arguments we cannot follow."

Nevertheless, the bulk of this volume consists of classified references, bringing its predecessors up to date. It will be useful to those who can follow the development of Selye's concept of stress, and to those who are interested in recent work on the hormones elaborated by the adrenal cortex. The book begins with an introductory review and includes 3 special articles : by J. T. Wortham and J. W. Headstream on "The effects of bilateral total adrenalectomy in diabetics"; by R. W. Porter on "Neurophysiological aspects of the control of ACTH secretion"; and by D. M. Green on "Hypertension". Finally, there is a "Sketch for a unified theory of medicine" which demonstrates clearly that Selye's disciples must master a difficult terminology and philosophy before they attain grace. The reviewer comforted himself by reading R. C. Garry's review of Selye's original monograph (Abst. 6280, Vol. 20).—A. M. Thomson.

5601

HALL, V. E., FUHRMAN, F. A. and GIESE, A. C. (Eds.) **Annual review of physiology. Volume 16.** Annual Reviews, Inc., Stanford, Calif., 1954, pp. ix + 545.

5602

CUTTING, W. C. and NEWMAN, H. W. (Eds.) **Annual review of medicine. Volume 5.** Annual

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Reviews, Inc., Stanford, Calif., 1954, pp. ix + 490.

5603

STEELE, J. M. (Ed.) **Methods in medical research. Volume 6.** The Year Book Publishers, Inc., 200 E. Illinois St., Chicago, 1954, pp. xiii + 271. Price 53s.

5604

WOLSTENHOLME, G. E. W. (Ed.) (with FREEMAN, J. S.) **Ciba Foundation colloquia on endocrinology. Volume 6. Hormonal factors in carbohydrate metabolism.** J. and A. Churchill, Ltd., London, 1953, pp. xiv + 350. Price 35s.

5605

YOFFEY, J. M. (Ed.) **The suprarenal cortex. Proceedings of the fifth symposium of the Colston Research Society held in the University of Bristol April 1st-4th, 1952.** Butterworths Scientific Publications, London, 1953, pp. vii + 232. Price 42s. net.

5606

NORD, F. F. (Ed.) **Advances in enzymology and related subjects of biochemistry. Volume 15.** Interscience Publishers, Inc., New York, 1954, pp. x + 547.

5607

KOCH, F. C. and HANKE, M. E. **Practical methods in biochemistry.** Baillière, Tindall and Cox, Ltd., London, 1953, 6th ed., pp. ix + 537. Price 38s. 6d.

5608

WOLSTENHOLME, G. E. W. and CAMERON, M. P. (Eds.) **The chemical structure of proteins. A Ciba Foundation Symposium.** J. and A. Churchill, Ltd., London, 1953, pp. xii + 222. Price 25s. net.

5609

OGINSKY, E. L. and UMBREIT, W. W. **An introduction to bacterial physiology.** W. H. Freeman and Co., San Francisco, 1954, pp. xi + 404. Price 51s.

The authors of this book have successfully resisted two temptations which beset all writers and are a common cause of bad textbooks. The first error is the rigid exclusion of all uncertainty, so that the reader reaches the last page feeling that he has mastered a closed and finished science. The other now very popular fault is to employ such an excessive sprinkling of doubt and qualification that all that remains memorable of the dish is the seasoning. Avoiding these temptations, Oginsky and Umbreit have produced a work which will give

pleasure to teachers and the minimum of pain to students, for whom the book is intended.

In the reviewer's opinion there are only 4 modern, advanced, textbooks of bacterial physiology; and the best of these covers a limited range of topics. The most comprehensive of the 4 is so unselective that it can be used only as a reference book. But even if the field were crowded this new work would have no difficulty in finding a place. Within the short space of 400 pages the authors deal briefly, but fairly, with all the important aspects of bacterial physiology. They have kept firmly before them their definition of the subject: "... a study of bacteria as examples of living material, a study of a form of life", with the result that the book possesses an unusual degree of coherence.

After a brief introduction to the nature and scope of bacterial physiology there is a compact outline of bacterial anatomy, the study of the individual cell. This is followed by a section on populations, covering growth, nutrition, the effect of the physical and chemical environment, and the genetics of bacteria.

The next section is concerned with the metabolism of bacteria and, in the course of about 150 pages it deals more than adequately with what is probably the most difficult aspect of bacteriology to teach coherently; the body of known facts grows rapidly, but many of the facts have not yet been fitted into a readily understood pattern. The chapter on energy can be highly recommended to all bacteriologists whose knowledge of thermodynamics is buried in a remote undergraduate past. The authors' novel treatment of this difficult subject throws some light on what for many bacteriologists is an obscure and confusing branch of cell chemistry.

Examples of other topics which are dealt with in later sections are adaptation, mechanisms of survival, and virulence as a physiological problem. Where shortage of space prevents a full treatment, well-chosen references provide an adequate guide to further study.

A final word should be said about 3 features in which this book excels. First, the illustrations are extremely good, apparently because an artist has made the drawings. Second, the references have been carefully selected and are usually accompanied by the authors' comments on the topic covered and the method of treatment used. Though restricted in number they provide a comprehensive cover of most aspects of bacterial physiology. Third, a list of questions is provided at the end of each chapter. These are so framed that they both provide the jaded examiner with new ways of wording old questions and encourage the student to think about what he has been reading.

The impression may have been given that this book is of interest only to teachers and students of

bacteriology, the audience for whom it was intended. In fact, the experienced bacteriologist will find much to stimulate his thought in the authors' new presentation of well-known material.

R. B. Morrison.

5610

BROWN, D. **Methods of surveying and measuring vegetation.** *Commonwealth Bureau of Pastures and Field Crops, Bull. No. 42, 1954, pp. xv + 223.* Published by Commonwealth Agricultural Bureaux, Farnham Royal, Bucks. Price 35s. post free.

This book compiled by Miss Brown of the Commonwealth Bureau of Pastures and Field Crops should be read by every agronomist. The subject matter, dealing as it does with methodology, should have a wide appeal for biologists generally. The monograph is well illustrated, many of the photographs being of really excellent quality. Techniques of grassland measurement are reviewed as they concern the world-wide variety of environmental conditions including the various range lands of the tropics and sub-tropics, but chiefly those in more temperate zones. The book contains details of the numerous methods that have been found useful for botanical analysis, for measuring yields and utilisation applicable, in the aggregate, to all sorts of grassland, from the most intensive to extensive use of land. Many of the chapters will appeal to progressive farmers and pastoralists; for example, chapter 16 which deals with pasture recording should be studied and the findings might well be acted upon by progressive men in Britain and other countries. The chapters (14 and 15) concerning the animal and its production at pasture are excellent, although in places the author tends to go into too much detail, almost to the point of being unnecessarily repetitive. The chapter on the theory of sampling, contributed by G. M. Jolly, offers a well-reasoned theme, but there is one statement in it upon which the reviewer must comment. Methods of sampling are discussed and here the author writes (page 16): "In a pasture where the vegetation is highly variable . . . it may be advisable to work with quite a small unit, otherwise an undesirable amount of material may require to be sampled to give the required degree of accuracy. An extreme case of this type would be the sampling of an area of grassland mainly occupied by two species which tended to occur in large areas of say half an acre occupied almost solely by one species. . . . A very considerable increase in accuracy would be achieved by halving the size of the sampling unit and doubling the number of units [quadrats] . . ." The pasture agronomist must quarrel with this approach because the biologist ought first to define the limits of his plant associations and then take his measurements within each.

Quite clearly in the instance quoted there are 2 well-defined associations and it is both biologically and, I suggest, statistically unsound to examine them other than as 2 separate pasture units. The reviewer never tires of asserting to his fellow agronomists that they must tread warily of statistics—like fire or water, statistical treatment is an excellent, even indispensable, servant but an awfully bad master.

This monograph by Miss Brown is the outcome of long sustained study of the literature, and she is to be congratulated on a task well done. It is by no means easy to keep pace with the very rapidly expanding literature in the field of grassland and animal agronomy. Possibly for that very reason the book does not give adequate cover to works reported upon since 1949. One other aspect not dealt with at all (or given but the briefest mention) is that of grassland surveys. Such surveys as have been carried out in various parts of the world including Britain, New Zealand, Australia, N. Rhodesia, Kenya and Holland have provided valuable basic data, but the techniques of mapping and the field procedures differ widely from place to place. It is to be hoped that Miss Brown will add a chapter dealing with this subject when comes the time (as surely it soon must) to produce a second edition.

W. Davies (Herbage Abstracts).

5611

DOEHNER, H. (Ed.) *Handbuch der Schafzucht und Schafhaltung. Band 4. Die Leistungen des Schafes. [Handbook of sheep breeding and sheep rearing. Volume 4. Sheep products.]* Paul Parey, Berlin and Hamburg, 1954, pp. xiv + 670. Price DM. 25.

The earlier volumes of the "handbook" deal with breeding, management, feeding and disease. Unfortunately they are out of print. Nearly two-thirds of this volume is devoted to wool, its morphology, chemistry and chemical structure, growth and strength, shearing, handling and processing from sorting to the dressing of the finished web. The section on meat production covers the choice and management of mutton sheep, the handling and processing of the meat, the judgement of quality and fat stock shows and finally statistics of production and consumption. Ewe's milk takes more space, with a historical review of its uses, and a brief review of composition and the external influences that affect it, and the processing of milk; a sub-section deals with colostrum. There are relatively short sections on skin and leather and on the value and use of sheep manure. Processing of the skin as fur is not dealt with.

The book is well printed and well bound. It is very well illustrated with diagrams, photomicrographs and photographs. The tabular material

is a mine of information. The text, of course, varies somewhat in style from one author to another; on the whole it is crisp and clear. But what is most attractive, and it is not often a "handbook" can be called attractive at all, is the combination of the scientific and the practical. Wool markets, knitting machines and hand looms give added interest to morphology and statistics. The importance of science for production and processing is everywhere clear.

Treatment is naturally from the point of view chiefly of German customs and methods, and it is not, strictly speaking, complete; no one book on such a subject ever could be. But for a general survey it is outstanding. If the earlier volumes are as good it is the more to be regretted that they are out of print.—I. Leitch.

5612

BARNETT, A. J. G. **Silage fermentation.** Butterworths Scientific Publications, London, 1954, pp. x + 208. Price 27s. 6d. net. [Dept. Biol. Chem., Univ. Aberdeen.]

The first 4 chapters of this book are devoted to

the more practical aspects of silage making, including the use of acids and other additives, types of silo, and losses in the ensiling process. The chemical and biological processes are discussed in succeeding chapters and the remainder of the book is devoted to a somewhat unnecessarily detailed account of methods of analysis and a brief discussion of the nutritive value of silage. The grouping of some of the subjects which, as the author indicates in his introduction, may be open to criticism, appears to have led in some places to unnecessary repetition.

The book is well produced in clear type and is furnished with ample references to the literature. It seems a pity that the price of a book written primarily for the student should be so high.

W. Godden.

5613

DEPARTMENT OF AGRICULTURE FOR SCOTLAND.

Agriculture in Scotland. The report of the Department of Agriculture for Scotland for 1953. H.M.S.O., Edinburgh, 1954, Cmd. 9113, pp. 91. Price 3s. 6d. net.

8. FOOD AND AGRICULTURE ORGANIZATION (AND OTHER ORGANIZATIONS) OF THE UNITED NATIONS

Monthly Bulletin of Agricultural Economics and Statistics. Vol. 3, No. 6, June 1954, pp. 62. Price \$0.50.

Disposal of agricultural surpluses. No. 7, July 1954, pp. 44. No. 8, August 1954, pp. 44. **Food price policies in Far Eastern Countries.**

Yearbook of Food and Agricultural Statistics, 1953, Vol. 7, Part 1. Production. Rome, Italy, 1954. Price \$3.50.

Commodity Policy Studies No. 5. Disposal of agricultural surpluses. Rome, Italy, June 1954. Pp. iv + 42. Price \$0.50.

Reprint of articles in *Monthly Bulletin of Agricultural Economics and Statistics*, 1954, 3, Nos. 5 and 6.

The State of Food and Agriculture 1954. Review and outlook. Rome, Italy, 1954. Pp. iv + 157. Price \$1.50.

The world review indicates that the upward trend of total agricultural production continued during the year ending in the middle of 1954. There was, however, a fall in trade as a result of good harvests. Farm prices fell in North America but were stable in Western Europe and in some areas, including the Far East, maintained a rising tendency. In general, agricultural development continued to be retarded by lack of investment funds.

Regional problems are considered in respect of the 8 main geographical areas. In Western Europe there is

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need for stimulation of consumption by reduction of the costs of production, distribution and retailing. With the change in policy towards expansion of home consumption there seems little prospect of exports from Eastern Europe and U.S.S.R. becoming available. In North America production rose, exports remained much the same, and no decline occurred in domestic demand, with the result that stocks increased sharply. Exports from Latin America were higher in 1953 than in 1952, largely because of the recovery in Argentina. The acute phase of post-war shortage in the Far East has ended but, except in Japan, improvement in food consumption levels has been small. Demands for wool, meats and dairy products from Oceania have continued strong, but rising costs of production may provide difficulties. In the Near East there is need for a more intensified and diversified pattern of production. Of all regions Africa presents probably the most difficult problems with precarious economies to be diversified, internal markets to be developed, transport systems to be improved and dietary levels to be raised.

About one-third of the publication is taken up by the review of the present situation and outlook for 20 of the more important of the world's agricultural commodities.

FAO Nutrition Meetings Report Series No. 8. Report of the Third Conference on Nutrition Problems in Latin America. Caracas, Venezuela, 19-28 October 1953. Rome, Italy, June 1954, pp. 60. Price \$0.50.

This report differs from those on the earlier meetings at Montevideo in 1948 and at Rio de Janeiro in 1950 (see

p. 789, Vol. 20) in that repetition of numerous recommendations is largely avoided. One-third of it gives brief reference to 10 items: nutrition and food policy, extension of activities to rural areas, school feeding, nutrition of industrial workers, analysis of foods, dietary surveys, education in nutrition, place of nutrition in public health work, co-operation with workers in other professions, *e.g.*, education, and enrichment of food. The remaining two-thirds of the report deal with the more

detailed recommendations made by the Conference on the two subjects of protein malnutrition and endemic goitre.

The material prepared by the Venezuelan delegation has been referred to in Abst. 3571, Vol. 24.

Fisheries Study No. 3. Fish farming and inland fishery management in rural economy. Rome, Italy, July 1954. Pp. viii + 64. Price \$1.00.

9. DEPARTMENTAL AND OTHER REPORTS

UNITED KINGDOM.

Department of Scientific and Industrial Research. Report of the Food Investigation Board with the Report of the Director of Food Investigation for the Year 1953. H.M.S.O. London, 1954, pp. iv + 56. Price 3s. 6d. net.

SOUTH AFRICA.

The South African Institute for Medical Research. Annual Report for the Year ended 31st December 1953. Pp. 106.

Calcium metabolism in South African Bantu: serum calcium values in pregnant and lactating Bantu women; calcium intake and height and calcium intake and rickets; incidence of rickets in different areas.

Composition of Bantu breast milk; nicotinic acid, tryptophan and methionine.

Kwashiorkor in Bantu infants at weaning and liver function studies.

AUSTRALIA.

Commonwealth Scientific and Industrial Research Organization. Fifth Annual Report for the Year ending 30th June, 1953. Pp. 191.

Division of Animal Health and Production, Melbourne.

Copper content of blood and of liver in sheep and other animals in Western Australia.

Silica calculi in wethers in Western Australia.

Effect of diet on rumen digestion.

Energy metabolism of sheep with reference to nutrition and wool production.

Carbohydrate metabolism of pregnant ewes.

Drought feeding of sheep: addition of salt, ground limestone, urea, etc., to drought rations.

Toxicity of large rations of wheat for sheep.

Influence of nutrition on performance of breeding ewes.

Division of Biochemistry and General Nutrition, Adelaide.

Energy metabolism of sheep.

Vitamin A requirements of sheep.

Effect of chronic fluorosis in sheep.

Copper deficiency in rats and effects of molybdenum on copper metabolism.

Zinc deficiency in rats; metabolic defects in zinc deficiency.

Microbiological estimation of vitamin B₁₂.

Vitamin B₁₂ requirements of rats and use of rats in vitamin B₁₂ estimation.

Vitamin B₁₂ and haemopoiesis.

Nutrition and wool production.

Processes of rumination: passage of starch from rumen to abomasum; functions of abomasum; conversion of plant nitrogen to microbial nitrogen in rumen; fermentation of hemicellulose by washed suspensions of rumen bacteria; utilisation of urea.

Carbohydrate metabolism; insulin hypoglycaemia in ruminants; intermediary carbohydrate metabolism.

Cobalt and its relation to vitamin B₁₂ deficiency in sheep: production of vitamin B₁₂ in the rumen; vitamin B₁₂ in tissues of normal and cobalt-deficient sheep; vitamin B₁₂ and cobalt deficiency; cobalt deficiency under grazing conditions and its control by drenching.

Copper deficiency in sheep: effect of molybdenum on copper metabolism of depastured sheep; iron metabolism in copper-deficient sheep; absorption of copper by the sheep; dressing of copper-deficient pastures with copper sulphate.

University of Western Australia, Institute of Agriculture, Nedlands. Report for the Period, 1949-53. Pp. viii + 68.

Carbohydrates of subterranean clover.

Effect of variety and rotation on the vitamin B₁ and protein contents of wheat.

Influence of different sources of N on N retention and on rumen micro-organisms in the sheep.

Effect of varying dietary levels of protein and starch on N retention and on rumen micro-organisms.

Effect of amino-acid and sulphate supplements on utilisation of urea and other sources of N.

Amino-acid composition of rumen bacterial protein.

Effect of time on rumen bacterial concentrations and on metabolic studies with sheep.

Factors affecting the level of ammonia in the rumen.

Effect of rate of intake and differing feeding regimes on digestibility and rumen function.

Relationships between digestibility of diets, their "digestible energy" and nitrogen excretion in the faeces.

Amino-acid composition of seed proteins.

Oestrogenic effects of subterranean clover.

Alteration of protein utilisation with protein intake and with growth (rats).

CANADA.

Experimental Station, Lethbridge, Alberta. Progress Report 1947-1952. Pp. 51.

Development of paralysis in lambs from ewes fed on peavine silage.
 Effect of protein content of rations of pregnant and lactating ewes on birthweight and growth of lambs.
 Cull potatoes for feeder lambs and dairy cows.
 Legume seed screenings as protein supplement for lambs.
 Sugar beet tops for fattening lambs and cattle.
 Peavine silage or hay for fattening lambs and cattle.
 Vitamin A reserves of feeder lambs coming off range.

UNITED STATES OF AMERICA.

Sixty-sixth Annual Report of the New York State College of Agriculture at Cornell University and the Cornell University Agricultural Experiment Station, 1953. Pp. 115.

Relation of feeding and management to the cause of the "stiff-lamb" disease.
 Comparison of various protein supplements and supplemental mixtures, and the effects of vitamin supplements for growing and fattening pigs.
 Protein requirements of growing, fattening lambs.
 Long-time project in breeding to attempt to increase the fat percentage of the milk of Holstein-Friesian cattle to 4 per cent.
 Nutritional requirements of herbivora as studied by purified diet methods.
 Physiology and metabolism of fats and related constituents in animals.
 Effect of curing methods upon the feeding value of hay.
 Investigations with young dairy calves on the effects of the level of milk consumption, composition of dry starters, levels of starter and hay consumption, and rumen inoculation and antibiotics.
 Requirements and functions of cobalt in the rations of livestock.
 Value of cull beans in rations for fattening lambs.
 Study to determine the most economical methods of fattening steers under New York conditions using the maximum amount of pasture and other roughage with a minimum amount of grain.
 Milk production from permanent and rotation pasture mixtures, and its relation to herbage characteristics.

Requirements and functions of salt in the rations of dairy cattle.
 Causes and prevention of ketosis in ruminants.
 Development and use of indirect methods for the measurement of digestibility and rate of consumption of feedstuffs, particularly forages by ruminants.
 Value of molasses and urea in rations for dairy cattle.
 Influences of feeding and management practices of the young upon early rumen development and subsequent mature performance.
 Nutritional requirements of baby pigs.
 Whole body composition and carcass studies of cattle at different ages and at three nutritional levels.
 Chemical and biological evaluation of nitrogenous requirements of animals.
 Study of the feeding and management of suckling pigs.
 Digestibility and dry matter consumption of various feeds for beef cattle.
 Isolation and study of enzymes controlling plant and animal metabolism.
 Nutritional status of adolescents and pre-adolescents.
 Intermediary amino-acid metabolism.
 Lactation studies : 1. Techniques involved in obtaining quantitative data on lactation performance in guinea-pigs. 2. Studies concerned with *in vitro* metabolism of mammary gland tissue.
 Functions of vitamin B₁₂ and folic acid.
 Isolation, identification and functions of the unknown components of the vitamin B complex.
 Pantothenic acid, folic acid and nicotinic acid requirements of poultry.
 Requirements of poultry for vitamin B₁₂.
 Requirement of poultry for compounds furnishing labile methyl groups.
 Requirements of poultry for protein and amino-acids.
 Studies of the physiology of growth, development, production and food utilisation by poultry.
 Design of experiments utilising chick growth as the criterion of response.

Report of the New York State Veterinary College at Cornell University for the Year 1952-53. Pp. 95.

The time and order of appearance of the skeletal elements in the foetal dog.
 Glycaemic levels and rumen development in calves.
 Role of somatotrophin in carbohydrate metabolism in sheep.

